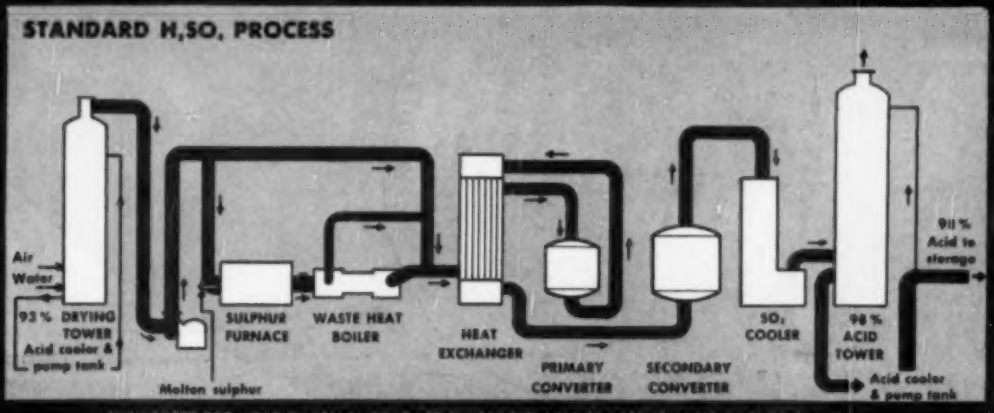
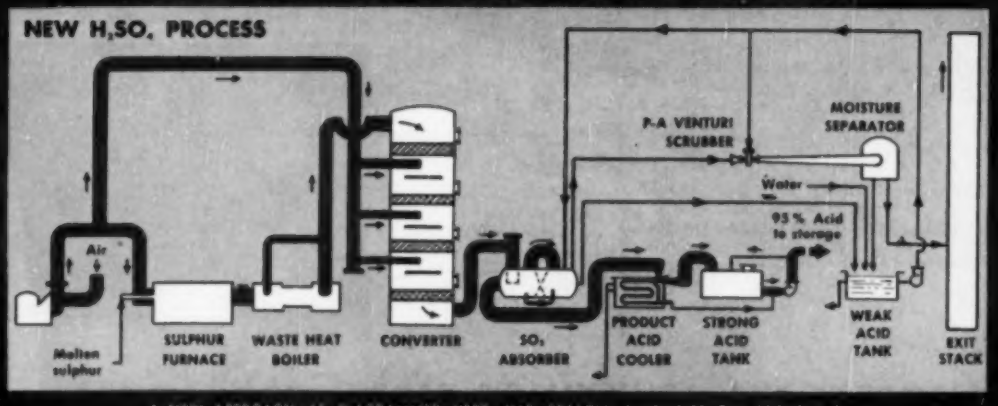
OCTOBER
1950

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING



FLOWSHEET FOR MOST EXISTING CONTACT SULPHURIC ACID PLANTS IS MUCH LIKE THIS, BUT



A NEW APPROACH AS DIAGRAMMED HERE, HAS GREATLY SIMPLIFIED THE PROCESS. P. 102

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Butadiene plant at El Segundo.

Rubber Resurrection Approaches

Resurrection of the West Coast synthetic rubber industry, which was born in World War II and interred afterward, is approaching. In Washington, RFC and Office of Rubber Reserve have uttered the revivifying word. Three government-owned plants in the vicinity of Los Angeles, center of the industry on the coast, were being checked last month with the prospect of an early return to production.

Slated for operation are: (1) the plant operated by Shell Chemical Co. for the manufacture and purification of butadiene, the major component of general-purpose synthetic rubber; (2) the butadiene plant at El Segundo operated by Standard Oil of California; (3) the copolymer plant that Goodyear Synthetic Rubber Co. and United States Rubber Co. operated to convert butadiene and styrene into rubber. Although time tables for operation were not definite several weeks ago, it is probable that the integrated plants will be clicking by the end of the year.

Today, one managerial change has occurred with respect to the copolymer plant which received butadiene from Shell Chemical Co. and Standard Oil. That plant has been slated to be operated by Minnesota Mining & Manufacturing Co. of St. Paul, Minn., and Pacific Rubber Co. of Oakland, Calif. Full capacity operation of the plant, which consists of three independent sections of equal capacity, is rated at 90,000 long tons per year.

During the previous war the plant that Shell operated manufactured purified butadiene from a butane-butylene raw material furnished by the nearby Shell Oil Co. refinery and by Southern California Gas Co. At El Segundo, Standard Oil Co. of California operated a Houdry-type unit producing butadiene by the catalytic dehydrogenation of normal butane, and sent the butadiene direct to the copolymer plant for conversion into rubber. Dow Chemical Co. furnished to the copolymer plant the styrene necessary for the conversion.

Alcohol Firm Changes Hands

Lac Chemicals, Inc., manufacturer of industrial alcohol at Los Angeles, has been sold by its parent company, American-Marietta, Chicago, to a newly organized group, West Coast Chemicals and Solvents Corp. The sale is in line with the parent company's policy of withdrawing from production of alcohol in favor of paints. Louis Crank resigned as president and general manager of Lac Chemicals effective Sept. 30.

Sale of Lac is the third sale of its California holdings which American-Marietta has made within the last year. The two other Los Angeles properties were Chlorine Solutions, Inc., and Pacific Chemical Co., the latter having been sold in June to Wyandotte Chemicals.

President of West Coast Chemicals and Solvents Corp. is Kenneth R. Simpson, Jr., a lumber and grain dealer of Santa Barbara. Other officials are Malcolm McDuffie, vice president and a director; Thomas M. Brunn, a vice president and director; Raymond J. Mattison, a director; and John H. Green, secretary-treasurer.

Phosphate Rock Gained Last Year

Production of phosphate rock in the western states, which totaled 826,500 long tons, increased about 1 percent over the 1948 output. Bureau of Mines figures show that an increase in production in Montana offset declines suffered in Idaho and Wyoming, Idaho being the largest producer of the four western states involved.

The output of phosphate rock in 1948 and 1949, although far below the 1947 production of 1,193,300 tons, nevertheless was almost double what it was in 1946. The severe decline of two years ago inevitably occurred as the result of the cessation of U. S. Army purchases for overseas shipments to occupied territories.

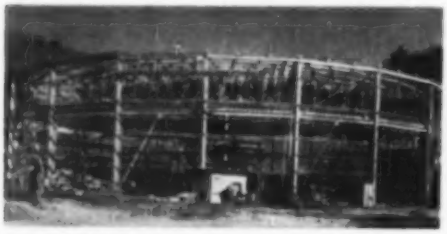
With respect to individual producers, in Idaho last year the largest producers in the state continued to be J. R. Simplot, Pocatello, which continued open-pit mining near Fort Hall. Much of the rock went to the elemental phosphorus plant which Westvaco Chemical Co. is expanding by the addition of a third electric furnace. The other reporting company in Idaho was Anaconda Copper Mining Co., which mines rock at Conda for shipment to the company's plant at Anaconda for conversion into superphosphate.

In Montana, producers were Montana Phosphate Products Co. (largest producer in the state), with mines at several points; George Relyea, whose mine is in the vicinity of Garrison; Anderson Brothers Mining Co., in the Garrison district; Manganese Products, Inc., near Hall; and Soluble Phosphate, Ltd., in Granite county. All the

shipped production by Montana Phosphate Products and by Relyea was sent to British Columbia, where Consolidated Mining & Smelting Co. produces ammonium phosphate and other fertilizers at Trail.

In Wyoming the only reporting producer was San Francisco Chemical Co., which mines leased property near Sage. Development work was under way near Kemmerer by Phosphate Mines, Inc.

A few hundred tons of phosphate was produced in Utah in the course of development work by F. J. Pearls Minerals Co. near Woodruff, in the northeastern part of the state, but no rock was shipped from the mine.



Bevatron building

Atom Energy Work Advances in West

At two major points of development of atomic energy in the West, Hanford Works at Richland, Wash., and the Atomic Energy Commission's reactor testing station near Idaho Falls, Idaho, new construction and plans for increasing output of fissionable materials are being accelerated.

At Richland, General Electric is taking on more than 500 additional permanent operating workers needed by the end of this year. These are being employed in addition to replacement for normal turnover. Suggestive that production at Richland is being increased is the fact that the company is looking for men experienced in engineering design and electrical and piping work.

From January through June, 1950, production of uranium 235 and plutonium was at a new record rate, exceeding that of 1949. Back of the growth has been the general increase in procurement of uranium ores, the processing of the raw materials, and acceleration of operation of the plant itself. During the period, the fissionables were manufactured at lowest unit costs yet attained.

In Idaho, where AEC has been constructing its big testing station near Idaho Falls, construction is under way on the experimental "breeder" reactor, the first major reactor in the high neutron energy range. Completion is scheduled for next year. The unit is being built to test the possibility of producing fissionable material more rapidly than the reactor consumes it. A materials testing reactor is being built to investigate the performance of various construction materials under neutron bombardment. The data should be of value in the design of future atomic power plants. In the design stage is a processing plant for recovery of nuclear fuel from used reactor fuel elements.

On the nuclear research front in the West, University of California is proceeding with the construction of its six billion-volt bevatron on the campus at Berkeley. It is being built in order to investigate on an unparalled scale the mechanics of nuclear phenomena. The installation, when completed in several years, will dwarf the university's presently operating cyclotron.

URANIUM ORE OUTPUT RISING

During the last six months several western companies have been expanding facilities for increasing the production of uranium ore on which the manufacturing operations at Hanford Works and other plants and laboratories are based. United States Vanadium Corp. is now operating, for the recovery of uranium, its vanadium mine at Uravan, Colo., which had been idle since 1945. Numerous plant changes have been made in order to produce the radioactive metal.

Climax Molybdenum Co., through a new affiliate, Climax Uranium Co., has announced that it will install at Grand Junction, Colo., a mill to produce a uranium concentrate for the Atomic Energy Commission. A former sugar mill is being rebuilt to house the processing equipment.

A deposit of uranium ore in the Sunshine mine in the Coeur d'Alene district of Idaho, which was discovered last year by geologists of the AEC, Sunshine Mining Co. and Bunker Hill & Sullivan Mining Co., is being extensively explored as a new source of the material.

AEC has opened an ore-buying depot at Marysvale, Utah, to provide an outlet for deposits discovered in the vicinity in 1949. Primary minerals are being encountered in several workings, with the possibility that pitchblend may be encountered.

More Sulphuric Acid, More Chlorine

Last month Stauffer Chemical Co., which put into operation at Henderson, Nev., additional capacity for chlorine and caustic soda, disclosed plans to construct a 200 ton per day sulphuric acid plant in southern California. The company had not decided on the location for the contact plant, but Vernon was tentatively named as the spot. Construction of the plant, to be designed and erected by Leonard Construction Co. in collaboration with Stauffer engineers, will begin shortly, and the unit should be in operation next summer. Decision to build the unit was based on growing demands for the acid by southern California refiners and other consumers.

The new plant, if built at Vernon, will be the second such installation there, where the company has facilities to manufacture superphosphate, both single and ammoniated; refined and ground sulphurs; a line of insecticides; and parts for storage batteries. The company, in addition to the existing acid plant at Vernon, also has acid plants at the California locations of Richmond, and Torrance.

At Henderson the company put into operation early in September the fourth of four lines of caustic soda cells primarily in order to meet a rising demand for chlorine. As a result of operating the fourth line the company can increase its shipments of chlorine to eastern markets. Other chemicals in addition to caustic soda and chlorine made by the company at Henderson are benzene hexachloride

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and lindane. At the same locality a Stauffer affiliate, Montrose Chemical Co. of California, manufactures monochlorobenzene, chloral, p- and o-dichlorobenzene and muriatic acid.

1949 Output of Inorganics Drops

Production of some inorganic chemicals last year in the West dropped off appreciably in some instances from output during 1948. The largest drop, percentagewise, occurred in natural soda ash, which fell off by 32 percent, a reflection to some degree of the generally unfavorable export market as well as partly a result of the closing of one producing plant during a part of the year. Output of the western chemicals last year, when compared to nation-wide production, remained substantially the same, on the percentage basis, during 1949 as they stood during 1948.

	Output, 1949	Percent Change, 1949 From 1948	Western Percent of U. S. 1949 Total
Carbon dioxide, solid	67,700	2.0	16.6
Carbon dioxide, liquid, gas	8,500	26.0	5.8
Caustic soda, liquid	159,200	−9.0	10.2
Caustic soda, solid	29,100	−11.0	11.3
Chlorine	153,900	−6.0	8.7
Hydrogen (million ft.)	2,200	3.0	7.3
Nitric acid	55,800	−1.0	6.0
Oxygen (million ft.)	1,200	−19.0	8.3
Soda ash, natural	202,300	−32.0	100.0
Sulphuric acid, new	109,800	−2.5	6.6

Production in tons except hydrogen and oxygen. Caustic data are electrolytic; no lime-soda process caustic in the region. Source: Census Bureau through San Francisco Chamber of Commerce.

New Organic Silicates on the Way

Development of a new group of organic silicates differing chemically from silicones has been disclosed by Oronite Chemical Co., subsidiary of Standard Oil Co. of California. Some of these products remain liquid in the range of from −100 deg. F. to above 700 deg. F. Among applications are heat transfer agents, lubricants, surface coatings and polishes. Much of the basic work leading to the products has been carried out by Hodges Research and Development Corp., Redwood City, Calif.

Oronite is surveying the markets for the products, which are not yet commercially available. California Research Corp., another Standard affiliate, is investigating possible new applications as well as other phases of the development.

New Salt Plant Under Way

At Redwood City, Calif., about 25 mi. down the peninsula from San Francisco, Leslie Salt Co., major western producer of salt, is getting well under way on the construction of a crude salt plant. The undertaking includes nine evaporation ponds with a total approximate area of 500 acres, a salt stacking area of about 600 x 600 ft., a wharf 450 ft. in length, and auxiliary equipment for handling the salt.

The wharf is on Redwood creek, which leads into the lower end of San Francisco bay. Across the bay eastward is the site of Leslie's older evaporation and refining operations near Newark.

The Redwood City project is part of an expansion program that the company expects to complete early next year, at which time Leslie considers its total capacity should be over 800,000 tons annually. The company's 1949 crop was 734,700 tons, which was 88,900 tons over the 1948 harvest.

With respect to Redwood City the company expects that dock facilities for loading bulk salt direct from storage to ships will be ready around next January. The initial salt harvest should be ready late next year, and it is believed that a more substantial harvest will be realized in 1952.

Cellulose Plant Near Completion

One of the northernmost big plants on the continent, Columbia Cellulose Co.'s $27 million high alpha cellulose plant near Prince Rupert, B. C., is scheduled for completion by December. Operation by the company, a subsidiary of Celanese Corp. of America, should begin during the first quarter of next year. Current plans call for initial production to be in excess of 200 tons per day.

Raw material for the plant will be spruce, balsam and hemlock which will be floated over the Skeena river from a tract of 600,000 acres of timber reserved to the company under the first forest management license granted in British Columbia. The first log drive was planned to begin several weeks ago. Acetic acid and acetone will be furnished by the large petrochemical plant that Celanese Corp. operates at Bishop, Tex. Water for the operation will be furnished through a 6.5 mi., 48-in. dia. pipeline. Over a mile of tunneling was required, the tunnel being driven through rock and lined with concrete. Provision has been made to carry ultimately about ten times the amount of water initially required, and a dam for impounding additional water in Lake Prudhomme has been started.

All buildings for the project have been roofed and walled. The boiler house is scheduled to be completed by November, and all major process equipment should be in place by December.

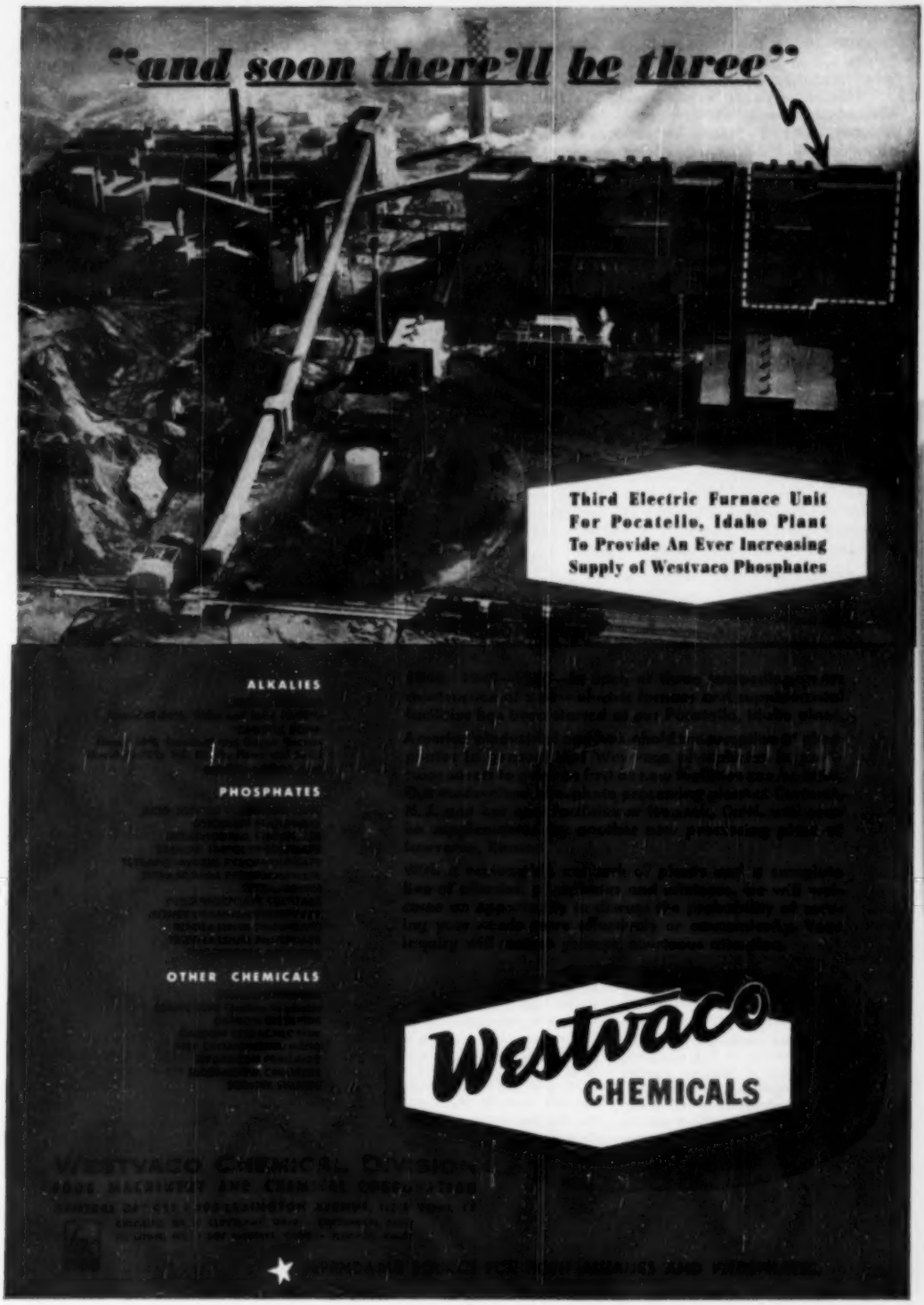
The plant is being built in order to assure the parent company a permanent source of cellulose to supply expanding requirements for the production of cellulose acetate for yarns, fibers and plastics. Celanese Pres. Harold Blancke, who inspected the project several months ago, says the plant is of strategic significance due to the effect of the war on the supply of purified cotton linters.

Colorado to Get Gas Line

General Petroleum Corp. and associated interests have formed a new company, Grand Valley Pipeline Co., to construct and operate an 80-mi. line to carry natural gas from a gas field in northwestern Colorado to Colorado river valley localities. General Petroleum's Executive Vice President P. S. Magruder, says the new company is a firm equally owned by General Petroleum Corp., M. B. Garman and Public Service Co. of Colorado.

Source of the fuel is the Piceance Creek field. Initial plans for the pipeline route are that the line will follow highways linking Rio Blanco, a town near the field, southward about 20 mi. to Rifle, thence southwestward from Rifle along the river a distance of 60 mi. to Grand Junction. At Rifle the U. S. Bureau of Mines operates its demonstration refinery for the manufacture of synthetic fuels from shale oil.

Contracts have been signed whereby General Petroleum will supply natural gas from the field to the new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company, and for the sale of gas by the company to Public Service Co. of Colorado for industrial and domestic distribution along the pipeline route to Grand Junction.

Officials of Grand Valley Pipeline Co. include P. S. Magruder, president; M. B. Garman, vice president and secretary; and F. T. Parks (vice president in charge of gas operations for Public Service), vice president and treasurer.

Montana to Get Aluminum Industry

Plans were being made last month for the construction of the first primary aluminum plant to be built in Montana. Harvey Machine Co., Torrance, Calif., which was unsuccessful in obtaining General Services Administration approval for the purchase of a site and equipment for a plant at Henderson, Nev., has established a branch, Harvey Machine Co. of Montana, as the first step to making aluminum in that state.

The project is still two or three years away from the production stage, however, according to the present outlook. The precise site for the plant had not been announced, although it will probably be built in the vicinity of Hungry Horse dam, now under construction. Power from the dam is not yet available. The new Montana company is capitalized at $5 million. A line of 140 pots purchased from the government's idle reduction plant at Riverbank, Calif., is scheduled to be installed, with an approximate capacity of 35 million lb. annually.

BURLINGTON'S POTS MAY MOVE WEST

While all indications last month were for an expansion of western primary aluminum capacity by the planned construction of the Harvey Machine Co. plant in Montana, there was the additional possibility that Kaiser Aluminum & Chemical Corp. might bring into the West either one or two pot lines from the government-owned reduction plant at Burlington, N. J., which Alcoa operated during the previous war. The big problem that Kaiser representatives have been mulling over with government officials in Washington in recent weeks is the availability of power, an issue that seemed likely to determine where the Burlington pot lines will be located.

Natural Gas Hearing Shelved

The Washington State Highway Department has postponed indefinitely a hearing it had scheduled for this year on the application of Trans-Northwest Gas Co. of Spokane for rights to lay gas pipe lines along highway rights of way.

Seattle Gas Co. and Northwest Natural Gas Co. had made known their opposition to the Trans-Northwest plans, which called for taking gas at the Canadian border from Westcoast Transmission, Ltd., of Canada, and selling to distributors in each city. Seattle Gas and other distributors have announced they want to deal directly with Westcoast Transmission or whatever other Canadian company ultimately gets export rights. Northwest Natural Gas is a rival of West coast for rights to export gas from Alberta.

The Alberta provincial government has issued no export permits as yet and is not expected to until next year. The pipeline company that gets an export permit from Canada then must get Federal Power Commission permission to operate in the United States.

FIRMS IN THE WEST

Infilco, Inc., manufacturer of water purification plants and sewage and industrial waste treating equipment, has established its technical divisions (research, development, engineering) at Tucson, Ariz. Manufacturing operations and certain other functions will remain at Chicago.

General Petroleum Corp., in a move to reorganize operations along more functional lines, has transferred its engineering and construction departments to the manufacturing department, which previously has embraced the refining, gas and laboratory operations. Gale L. Adams is vice president and director of manufacturing.

Bechtel Corp. has purchased two buildings in San Francisco at 101 California St. for the purpose of bringing together the company's engineering groups, which are at present scattered at several points in the city. The new buildings are expected to be ready for occupancy early in 1951.

Cee Bee Chemical Co., Los Angeles, has named Lesco, a San Francisco partnership, as distributor for its line of industrial and automotive cleaning compounds in northern California.

Victor Chemical Works, Chicago, has begun grading and excavation for the $5 million elemental phosphorus plant that will be built near Silver Bow, Wyo. Nicholson Co., Inc., New York, has the general contract. At the plant site, T. F. Edson is in charge for Victor.

Washington Hardboard Products Co. has been organized by Norman C. Aaron and Gordon B. Lynch, both of Seattle, to manufacture a resin-bonded hardboard. A plant near Raymond previously occupied by South Bend Prefabricators has been secured.

Capitol Paint Co. is installing a 500-gal. pebble mill at its plant in Sacramento to increase the production of paint by about 20 percent. The company is also adding research facilities to conduct experimental work on anti-fouling, mold-inhibiting and insect repellant paints. William P. Stone, formerly with R. N. Nason Paint Co., has become a vice president in Capitol Paint Co.

Amalgamated Sugar Co., Ogden, Utah, has decided to postpone its projected $500,000 sugar warehouse and distributing plant at Portland. The change in plans was caused by uncertainty as to whether sufficient construction materials could be obtained to assure completion of the project.

Monsanto Chemical Co. has opened at Long Beach, Calif., its plant to manufacture polystyrene molding compound, the first such plant on the Pacific Coast.

Aluminum Co. of America has put into full operation its $5 million wire, rod and cable plant at Vancouver, Wash. The plant, with a capacity of 3 million lb. per month, is operating two shifts with 200 men, but will probably add a third shift soon.

Westoil Terminal Co. is the name of a new firm which has bought the assets of Pacific States Oil Co., which has a refinery at Wilmington, Calif. The sale includes the 30,000 bbl. per day refinery and a tank farm. Head of the new firm is C. Edward Miller, formerly chairman of the board of Time Oil Co.

Paraco, Inc., processors of lubricants near Fresno, Calif., suffered a serious fire last month which destroyed major portions of the plant. Distillation and filtration equipment was included among the portions of the plant affected by the fire.

Permanente Cement Co. plans construction of three additional storage silos, each with a capacity of 10,000 bbl., at its storage plant near Seattle. The new construction, part of the company's current $3.5 million West Coast expansion program, is designed to increase storage capacity at Seattle by about 38 percent.

NAMES IN THE WEST

N. Krey

J. H. Lindemuth

Norman Krey has become manager of reduction plant operations for Kaiser Aluminum & Chemical Corp., and **J. H. Lindemuth** is now manager of the company's Mead aluminum reduction plant. Krey, associated with aluminum reduction for 19 years, joined Kaiser in 1946. Prior to his promotion he was reduction plant manager at both the Mead and Tacoma plants of the company. He is a chemical engineering graduate of Lehigh University. Lindemuth joined Kaiser in 1946 as carbon plant superintendent at the Mead works. He is a metallurgical engineer from Rensselaer Polytechnic Institute.

J. Reed Schaeffer, president and general manager of California-Fresno Asphalt Co., has been elected president of California-Fresno Oil Co., succeeding the late **T. A. Rushhaupt. Harold Maddis** has become general manager of the oil company.

C. T. Atwood

S. J. Anable

Charles T. Atwood has become manager of the new soap products and vegetable oil plant that Lever Brothers is building at Los Angeles. **Sidney J. Anable** has been named manufacturing superintendent. Other officials scheduled for residence at the new plant, which is still under construction, include **Robert E. Sessler,** plant superintendent; and **William C. Skarda,** chief chemist. Atwood, who joined the company in 1930, has been manager of the Lever plant at Edgewater, N. J. He is directing the installation of process equipment at Los Angeles. Anable, who will supervise all soap, shortening and margarine processes, has been with the company at Hammond, Ind.

Fred Hitchings, formerly manager of General Chemical Co.'s Los Angeles office, has become manager of the company's office at Chicago. **W. M. Cline,** who had previously been manager at Seattle, has been transferred to Los Angeles.

Robert Howe has become superintendent of Sinclair Refining Co.'s refinery at Sinclair, Wyo. An engineering graduate of Colorado School of Mines, he joined Sinclair in 1934, and became assistant superintendent at the Wyoming refinery in 1945.

E. G. Freeman has been named western sales manager for the Amino Products Div., International Minerals & Chemical Corp., with headquarters in San Francisco. He supervises operations in Los Angeles, northern California and the Pacific Northwest.

Fred L. Hartley has become general superintendent of operations at the Los Angeles refinery of Union Oil Co. In another company change, **Frank Lammerman** has been transferred to Union's glacier division as superintendent of plants, and will supervise the refinery and absorption plant at Cut Bank, Mont.

James W. Moller has become vice president and general manager of Kingsburg Cotton Oil Co., Fresno, Calif. He was previously an executive of the Jelke division of Lever Bros., New York.

R. W. Ayer has become refinery engineer for Salt Lake Refining Co., Salt Lake City. Previously he was supervising engineer for construction at the plant.

E. H. Todd, vice president of California

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Oil Co., California Refining Co., and Calmara Oil Co., has been elected president of Calmara Oil Co. All firms are subsidiaries of Standard Oil Co. of California.

F. H. Matthews

Fred H. Matthews has become manager of the crude and products department of Tide Water Associated Oil Co.'s western division. He succeeds the late **H. T. Earl**, to whom he had been assistant. He will also serve as a member of the western division's operating and production committees.

John F. McGarry has joined Bechtel Corp. as a supervising engineer in the company's San Francisco offices. He was previously associate professor in charge of process engineering at University of California, Berkeley, an institution he joined a year ago. Prior to his service with the university McGarry was assistant superintendent of the Shell Chemical Co. plant at Houston, and was in charge of process design for Shell Chemical during 1947 and 1948.

S. A. Salmonson has become Pacific Coast representative for Chemical Linings, Inc., Watertown, N. Y., with offices at Portland.

Harold R. Seykota has been named manager of sales of byproducts by Portland Gas & Coke Co., Portland, Ore. He was previously sales manager for Converse Co., Seattle.

John A. Ludwig has become sales manager for the paint division of The Paraffine Cos., Inc., Emeryville, Calif. He joined the firm a short time ago.

OBITUARIES

Elmon Lawrence Hall, 68, for 44 years associated with Portland Gas & Coke Co., died at Portland early last month. He was long associated with the development of the company's byproduct business, and assisted in designing its gas plant.

John C. Southard, 43, director of research at Solar Aircraft Co., San Diego, Calif., died last month. At one time Dr. Southard was chief process metallurgist for Titanium Alloy Manufacturing Co.

"Consolidated"
Prompt Shipment of WANTED EQUIPMENT
Used Single Items or Complete Plant
SEE PAGE 371
CONSOLIDATED PRODUCTS CO., INC.
15 Park Row
New York 7, New York

looking for reader service?

find it inside the back cover ...a permanent position

✳ **NOTE:**
The Advertiser's Index, formerly a part of Reader Service, is now separate and precedes this section.

Memo from the Editor

A Feather in Your Cap

Neither time nor age can stale the mark of distinction that goes with a red feather. In the Orient the legendary "Hagoromo" robe of feathers, sometimes red, could be worn only by people who had given outstanding service to their communities. In the South Seas and in Hawaii the "Mahiole"—a red feather headdress—was worn by chiefs and persons of royal blood.

In Europe, when knighthood was in flower, a red plume in his helmet was a sign of the true knight. Robin Hood—the story goes—awarded a red feather to each of his Merry Men for a good deed performed. In America many a young Indian had to win his place at the Council of the Braves by plucking a feather from a live eagle and wearing it, dyed red, in his scalp-lock.

"It's a feather in your cap" has come down to us from the customs of primitive people who stuck a feather in their headdress as a sign of service and accomplishment.

Today the Red Feather still stands for service—service the democratic way to the health and welfare of our fellow man in more than 1,250 American communities through more than 15,000 agencies.

Wear the Community Chest red feather this year—and wear it proudly!

Who's Doing What

When one of us wants to know right fast if such-and-such a company has added new facilities, new lines, new representatives or new locations, he usually makes a bee line to Editorial Assistant Frances Arne.

The reason is this: Frances handles "Industrial Notes"—our who's-doing-what department. To remind you of its usefulness we're featuring it this month as our department-of-the-month (p. 133).

How can you make use of this CE service department? Well, if you're intending to find out what those new sodium emulsions can do for your process, you'll want to know that National Distillers Chemical Corp. has moved its sales office from New York to Ashtabula.

Or you may be surprised to learn—as I was—that Hulman & Co. of Terre Haute has purchased Rhode Island's staunch Rumford Chemical Works. A. E. Marshall (president of the AIChE, 1934-35) will stay.

Or maybe you run a processing plant in Ohio and use Superior Electric's transformers or voltage regulators. Now you can get these right in Cleveland; Harold Lorenson's the man to call.

Or if you're a westerner—as I am—you'll naturally take pride in the two big plants to go up out there: (1) Monsanto's polystyrene molding compound unit in California—first on the Pacific Coast, and (2) Victor's $5 million phosphorus plant in Wyoming. (Off the record, a third phosphorus producer will probably go West soon.)

Or . . . that George Russell has set up a company in Houston that will specialize as consultants to petroleum processors . . . that Johnson & Norman will represent Buffalo Pumps in New York . . . that General Dyestuffs Corp. will now sell General Aniline's detergents and emulsifiers . . . that Bob Cahill has been made Foxboro's resident engineer in Minneapolis. . .

To keep posted on who's doing what, read "Industrial Notes" every month. We do!

Bits and Pieces

• Next month's pictured flowsheet: DDT—probably the first flowsheet to be published on how the stuff's actually made on a large scale. It will also be our 143rd consecutive pictured flowsheet since we started this monthly feature back in 1939.

• Back in 1947 Dow and Sherwin-Williams started an ambitious paint testing program under the tough atmospheric conditions of the Gulf Coast. On page 110 you'll find the results of three long years of work summarized in six pages.

• Something to look forward to in November: our 14th Biennial Report on Materials of Construction. It will be 48 pages of practical, first-hand information slanted for the engineer that designs, specifies and uses chemical process equipment.

• "Nobody ever stumbles who is sitting down."—C. F. Kettering.

種々の使用目的に適した食塩

(James A. Lee chem. met. Eng. 47. 530～4)

訳者　三代川清造
　　小川恒彦

(訳者序　本文はマクグローヒル出版社及び著者の御好意により弊社編集部に対し無償を以て翻訳が許可されたものであって、許可書に原文の意味を変めるようなことのないようにとの注意がありましたので、極力意譯を避けて原文に忠実な譯になるように努めました。
尚本稿に関し御助言を賜った前記各位に対し厚なる謝意を表する次第であります。)

If you happened to miss Jim Lee's easy-to-follow flowsheets on salt refining processes, you might like to see how one of them looks when the equipment is labeled in easy-to-follow Japanese. This appeared in the publication *Salt Engineering*.

OCTOBER
1950

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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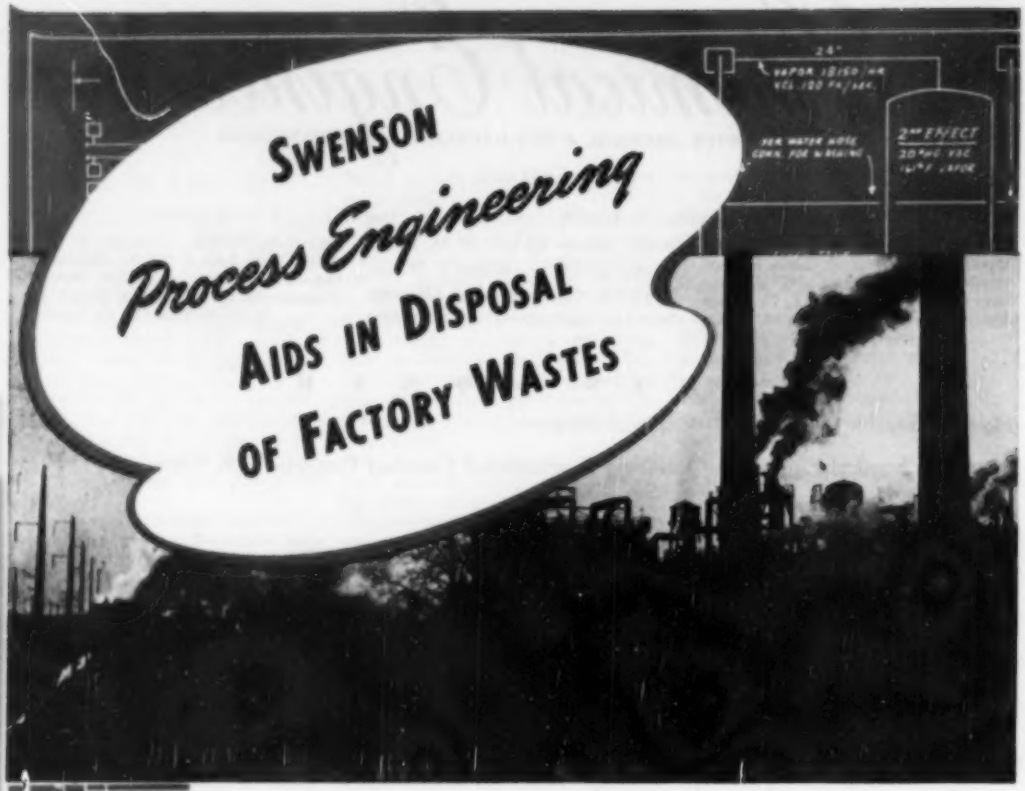
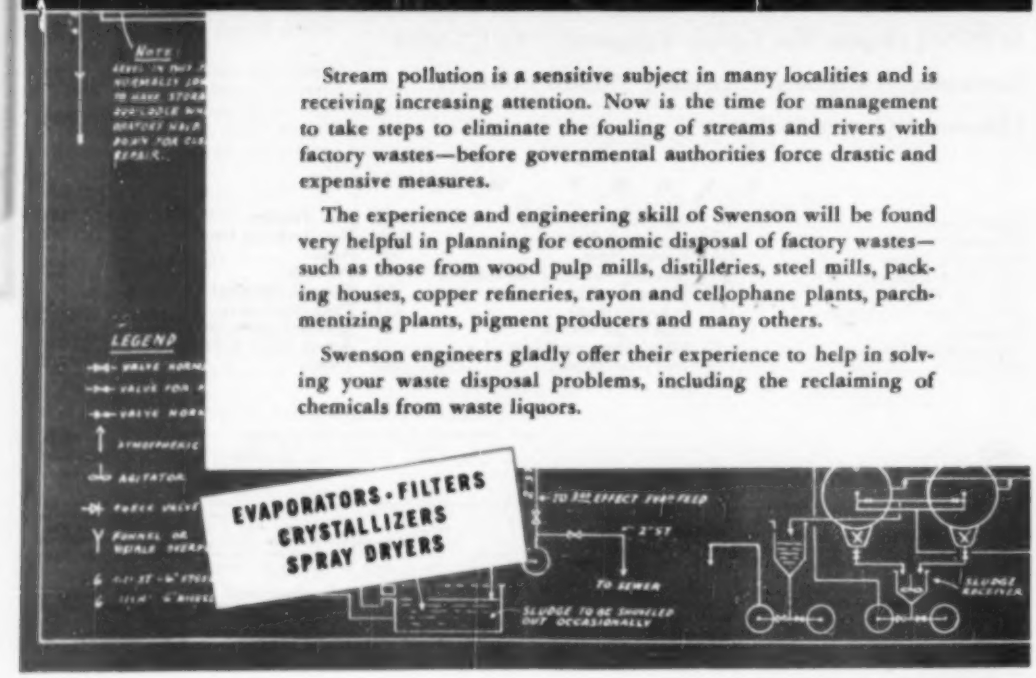


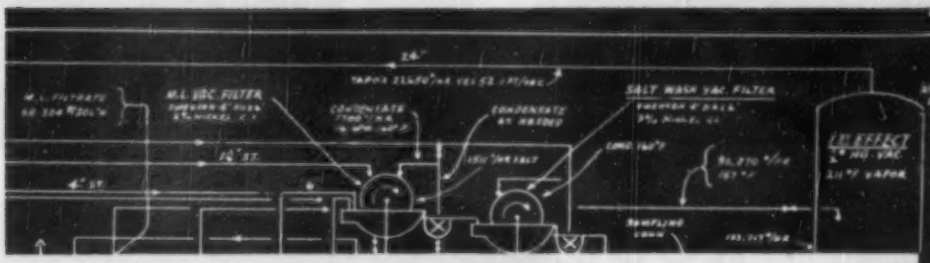
SWENSON *Process Engineering* AIDS IN DISPOSAL OF FACTORY WASTES

Stream pollution is a sensitive subject in many localities and is receiving increasing attention. Now is the time for management to take steps to eliminate the fouling of streams and rivers with factory wastes—before governmental authorities force drastic and expensive measures.

The experience and engineering skill of Swenson will be found very helpful in planning for economic disposal of factory wastes—such as those from wood pulp mills, distilleries, steel mills, packing houses, copper refineries, rayon and cellophane plants, parchmentizing plants, pigment producers and many others.

Swenson engineers gladly offer their experience to help in solving your waste disposal problems, including the reclaiming of chemicals from waste liquors.





Swenson System for Processing Steel Mill Pickle Liquor

The disposal of sulfuric acid from steel mill pickling systems has always been a problem, but became more so with the advent of the continuous strip mill—because of the higher acid concentrations involved.

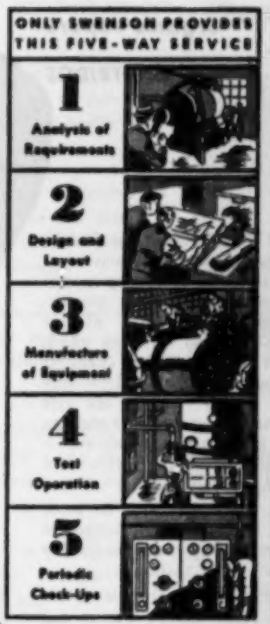
Swenson has developed special acid-resistant evaporator, crystalizer and filter equipment for the removal of water and copperas, and the recovery of sulfuric acid for return to the pickling system. This represents a definite saving in sulfuric acid in those cases where acid of fairly high concentration is discharged from the pickling system.

The service of Swenson Process Engineering to the steel mill industry is but one of many such instances which may be cited to show how Swenson has devised effective processes for the economical disposal of factory wastes.

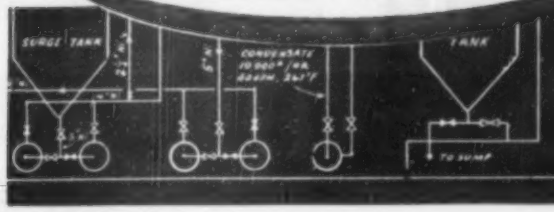
SWENSON EVAPORATOR COMPANY
Division of Whiting Corporation

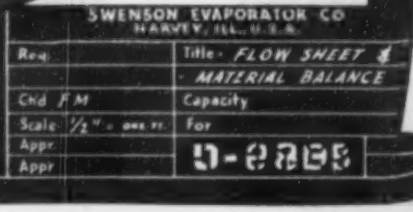
15669 Lathrop Avenue Harvey, Illinois
Eastern Sales Office and Export Department: 30 Church St., New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 Laplante Ave., Toronto 2

ONLY SWENSON PROVIDES THIS FIVE-WAY SERVICE



SWENSON
EVAPORATORS • FILTERS • CRYSTALLIZERS
SPRAY DRYERS

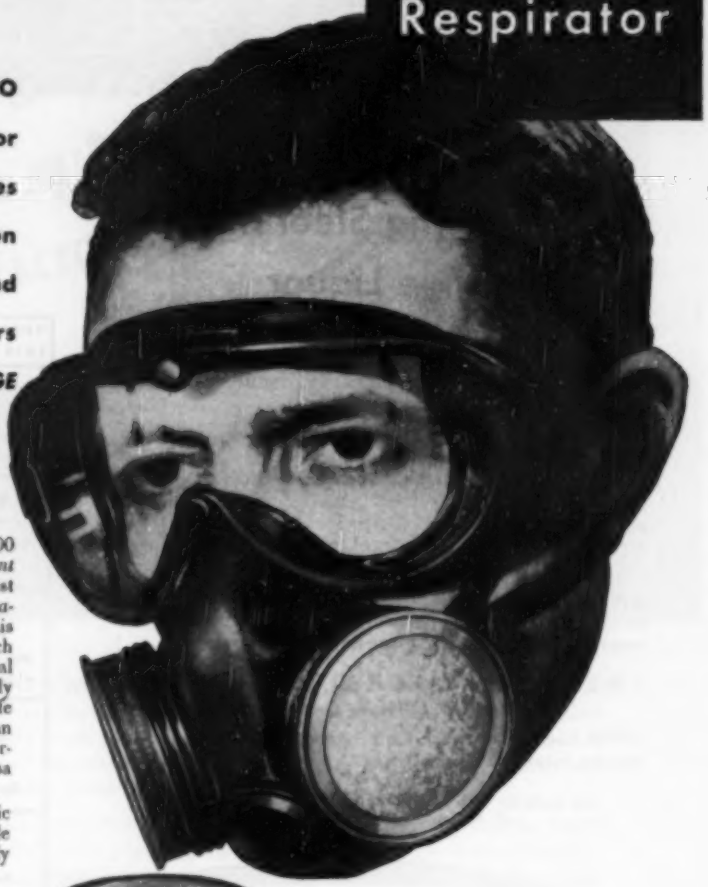




Another AO "First" in Protection!

AO R5055 Respirator

Only the AO Twin Cartridge Respirator has Bureau of Mines Approval for protection against all dusts and organic vapors *IN ONE CARTRIDGE*



Yes, the AO R5055 Respirator (R5000 line) leads the way to a new, *convenient* standard of safety by protecting against organic vapors and all dusts *simultaneously*. The "business end" of this protection is the R55 cartridge which contains *both* a highly efficient chemical absorbent and a cover of chemically treated felt. Result: wearers are safe when both hazards are present and can move freely from dust to organic vapor-contaminated atmospheres or vice versa without changing cartridges.

The R-5055 Respirator with its basic R5000 Face Piece and interchangeable cartridges and disc filter can be quickly converted to protect against

(1) A combination of all dusts
(2) Light organic fumes, vapors and gases
(3) Acid gases, fumes and mists
(4) Combined acid and organic gases
(5) Low concentrations of ammonia
(6) Metal fumes as in welding, burning, smelting, refining

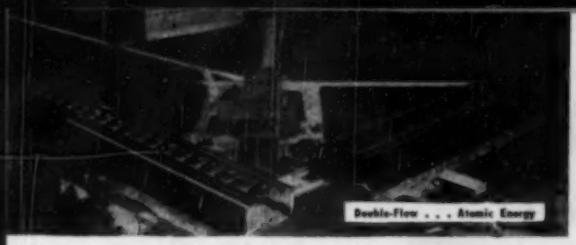
Your nearest AO Safety Products Representative can supply you with this "7-in-1" respirator that gives *double* the protection.

QUICK FACTS

- New threaded chemical cartridges
- Famous AO disc type filters
- Increased visual area
- New face piece
- New flexible fitting brace
- New port and valve design
- Double headband

American Optical
SAFETY PRODUCTS DIVISION

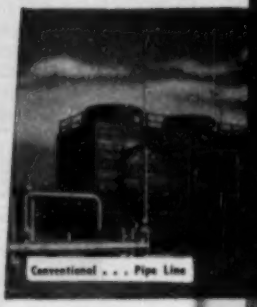
Southbridge, Massachusetts • Branches in Principal Cities


Double-Flow . . . Atomic Energy

Double-Flow . . . Natural Gasoline

WHAT IS YOUR COOLING PROBLEM?

Spray Pond . . . Refinery

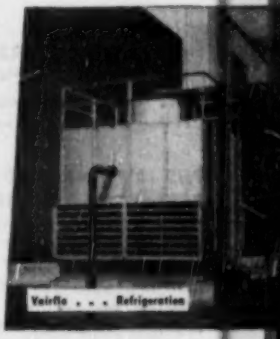

Conventional . . . Pipe Line

IS IT COST? Cooling towers or DriCoolers can have a low first cost with higher operating cost and vice versa. Or, you can get an economical combination of both. Marley application engineers have a complete line of units to select from and the "know-how" to help you make the best selection for your purpose.

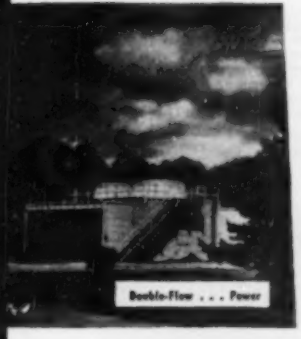
DriCooler . . . Diesel Cooling

IS IT SPACE? Marley equipment may be installed indoors or outdoors. Units are available with large base area and low height to give light loading per square foot or with small base area and greater height to fit in small area.

IS IT TEMPERATURE? Usually, it is not economical to cool lower than a 5F approach to the wet bulb. However, in Marley cross-flow towers a quantity of water at wet bulb temperature may be obtained without added cost. For high level cooling, the DriCooler is applicable.


Vairflo . . . Refrigeration

IS IT LOCATION? Extreme temperatures, cold or hot, dust, wet bulb, altitude, brackish water, wind, storm conditions, or lack of proper water supply are problems that must be considered. Marley has a unit to fit any geographical condition.


Double-Flow . . . Power

IS IT APPEARANCE? Marley has a wide range of designs that will blend with any building architecture. Or even become a part of the building itself. Marley engineers can help your architect give you a good looking as well as efficient installation.

DriCooler . . . Gas Cooling

These are only a few of the problems you may face in the selection of a cooling tower or DriCooler. No matter what the problem, Marley Application Engineers have the answer to help you invest your dollars wisely and profitably.

MARLEY

Natural Draft . . . Air Conditioning

Aquatower . . . Air Conditioning

Write, Wire or Phone The Marley Company, Inc., Kansas City 15, Kansas.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

☐ Please send "What's Your Cooling Tower IQ"

☐ Our Cooling Problem is _____

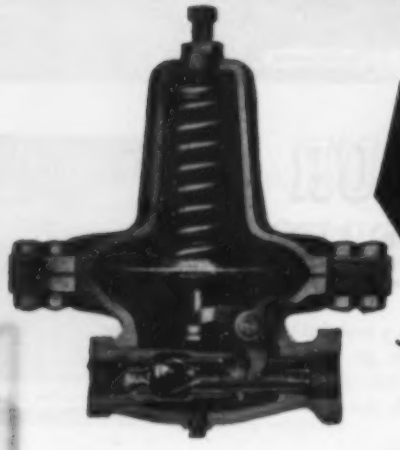
08-10

10 POINT *Results*

FROM

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE **REDUCING VALVES**

THESE TROUBLEMAKERS FIND NO OPPORTUNITY TO PERFORM WITH THE "1000" ON THE JOB



A MANUFACTURER CHECKS THE 10 POINTS AND SAYS . . .
"We have 3 of these '1000' valves and all of them are giving good service."

THE 10 POINTS ARE CHECKED BY A RESEARCH FOUNDATION, THEY SAY
"These valves have been VERY SATISFACTORY BOTH IN OPERATION and MAINTENANCE. The MAINTENANCE COST IS ABSOLUTELY NOTHING once this '1000' valve is installed. Wherever any one may need CONTROLLED PRESSURE IN EITHER STEAM, AIR, or ANYTHING—this CASH STANDARD '1000' valve can be relied upon to do just that and TO GIVE CONTINUED TROUBLE-FREE service."

A MEAT PACKER SAYS IN CHECKING THE 10 POINTS . . .
"Very little maintenance required."

A STEEL CASTING CO. CHECKS THE 10 POINTS—THEY SAY . . .
"We find your CASH STANDARD Streamlined Type '1000' Pressure Reducing Valves to be VERY RELIABLE. We have a number of these valves in service throughout our plant, and have NEVER HAD ONE OUT OF SERVICE for any reason. These '1000' valves have been in service for approximately five years."

A MOULDED PRODUCTS CO. CHECKS THE 10 POINTS AND SAYS
"Maintenance time and cost very low."

These are the Points **USERS CHECK WITH . . .**

1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them

Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

THIS IS THE WAY TO

Magnify YOUR FILTRATION CAPACITY!

When demand skyrockets, filtration is all too often the bottleneck that prevents quickened output.

Bird Continuous Centrifugal Filtration generally provides the needed short cut to expanded production.

The Bird Filter separates the solids — whether they be micron size particles or half inch lumps — from thick or thin slurries. It gets rid of batch operation and of slow, messy filter cloth fill ups and changes. It is quick, clean, continuous, economical — whatever the volume.

GET THE FACTS...FAST

The Bird Research and Development Center is completely equipped to develop authentic test findings on every solids-liquid separation problem — and do it without delay. Now is the time to make the most of these unique facilities. Get in touch with

BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS

BHC

BENZENE HEXACHLORIDE FROM

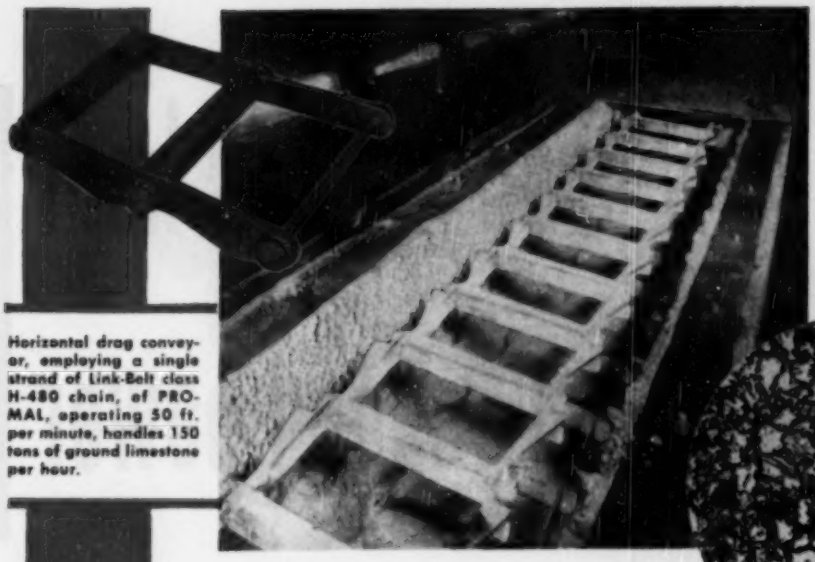
TENNESSEE

Grinders and formulators will recognize Tennessee's technical BHC as a quality product. BHC, with a high average gamma content, easily ground, can increase your plant capacity and save you money.

When you buy chemicals from Tennessee, you are served by the only company whose rigid production and quality control starts with basic materials and protects each order until it reaches your plant. This integrated production pays off because it assures a smooth flow of dependable supply. You get as much as you need, just as you need it when you order chemicals from Tennessee.

TENNESSEE PRODUCTS & CHEMICAL *Corporation*

NASHVILLE, TENNESSEE

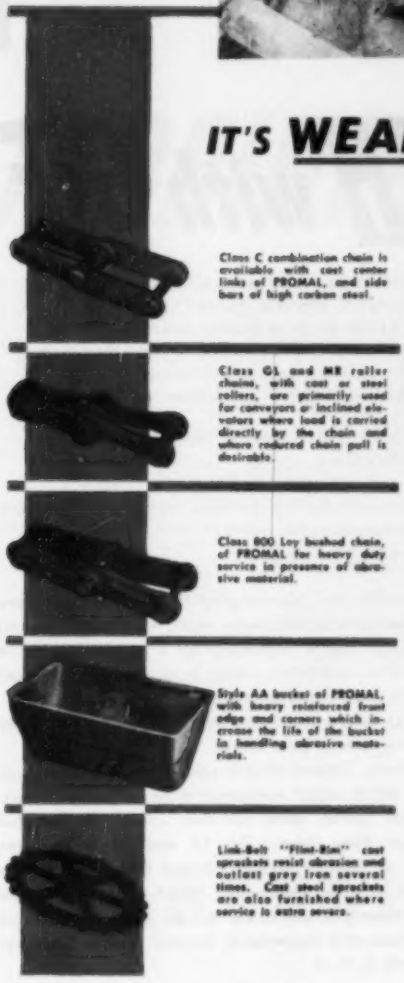


Horizontal drag conveyor, employing a single strand of Link-Belt class H-480 chain, of PROMAL, operating 50 ft. per minute, handles 150 tons of ground limestone per hour.

The photo-micrograph below (100 times actual size), clearly shows the tough network structure which gives PROMAL its great strength and resistance to wear.

IT'S WEAR THAT MAKES THE MONEY GO

LINK-BELT PROMAL CHAINS *Resist Wear Longer*



Class C combination chain is available with cast center links of PROMAL, and side bars of high carbon steel.

Class G1 and MR roller chains, with cast or steel rollers, are primarily used for conveyors or inclined elevators where load is carried directly by the chain and where reduced chain pull is desirable.

Class 900 Lay bushed chain, of PROMAL for heavy duty service in presence of abrasive material.

Style AA bucket of PROMAL, with heavy reinforced front edge and corners which increase the life of the bucket in handling abrasive materials.

Link-Belt "Flint-Rim" cast sprockets resist abrasion and outlast grey iron several times. Cast steel sprockets are also furnished where service is extra severe.

Strength, toughness and resistance to abrasion are characteristics of PROMAL, the stronger, longer wearing metal, that make it especially useful in chains and buckets. Where severe service conditions are to be met, PROMAL is the preferred metal. It may be repeatedly heated and cooled without damage or growth and may therefore be used in moderately high temperature applications.

PROMAL, an original Link-Belt development, has a uniform structure throughout its cross section, and its resistance to wear and abrasion continues after the surface is worn off. This resistance to wear is due to its own peculiar structure, and not to its Brinell hardness.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

LINK-BELT

Chains and Sprockets

low-cost process heat

dependable low-speed power

GET BOTH with G-E

If your plant uses process steam, you may be able to improve over-all heat balance by driving low-speed equipment with General Electric geared turbines. Mechanical drive turbines act as reducing valves to drop boiler steam pressures down to utilization temperatures for process requirements. With turbines skimming off only a small portion of the steam's heat, mechanical power for driving fans, blowers, pumps and other low-speed apparatus is almost free.

Standard Type DP and DR turbines, combined with General Electric precision-type gears, are ideal for many such applications.

PRECISION GEARING

General Electric balanced-thrust gears are specifically designed for use with turbine drives. Smoothness and quietness of operation are the result of maintaining tooth contours and spacing to a high degree of accuracy.

Positive lubrication assures long life. Oil is delivered to the bearings from a gear-type pump driven by the pinion shaft. The gear mesh is spray-lubricated.

To meet a variety of application requirements, these gears are available in ratios from 1.5 to 10.3.

PRECISION GOVERNING

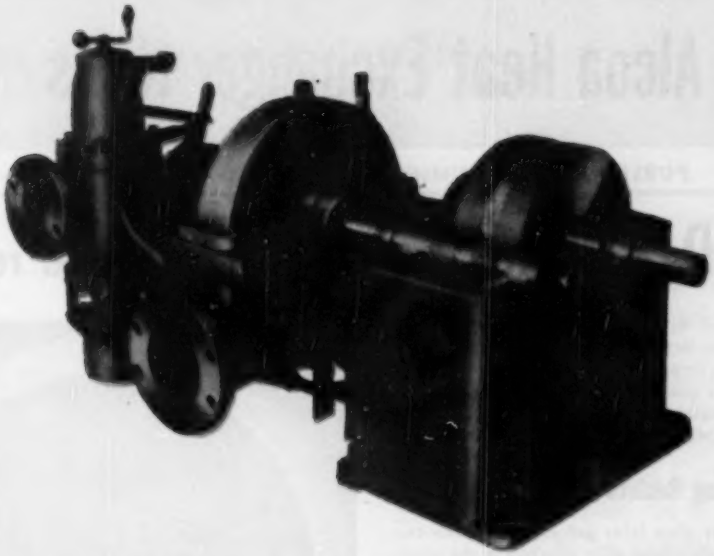
General Electric Type DP and DR turbines include extra features at no extra cost. The DP's hydraulic governing system provides a speed range of 30 per cent with 6 per cent regulation. The DR's oil-relayed governor offers speed ranges up to 5 to 1 with accuracy of ¼ of 1 per cent. Each turbine has its easily operated trip-throttle valve and governing valve combined in one compact unit. Rugged construction from quality materials makes these standard turbines outstanding for reliability and efficiency.

ONE INTEGRAL UNIT

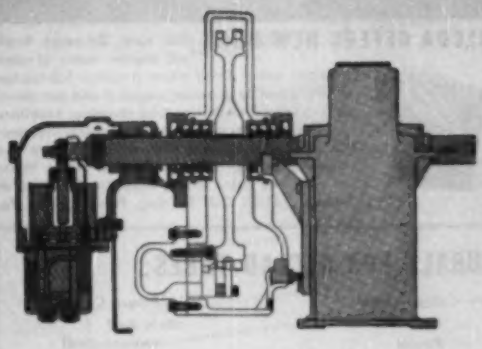
General Electric close-coupled turbine-gear sets have one common turbine and pinion shaft, with the turbine and gear casings solidly connected by a sturdy fabricated bracket. This construction results in a compact unit, does not require high-speed coupling.

Many standard parts are interchangeable with other turbine and turbine-gear drives.

Your nearby General Electric sales office will supply you with full details about mechanical-drive turbine-gear sets. Or, if you prefer, write for free copies of illustrated bulletins on these drives. The DP and DR turbines are described in bulletins GEA-4955 and GEA-5193. Bulletin GEA-5152 contains information about gears. Learn how installing these precision drives in your plant can save you money. Apparatus Department, General Electric Company, Schenectady 5, N. Y.



TURBINE-GEAR DRIVES



HERE'S WHAT STANDARDIZATION PROVIDES FOR YOU

This diagram shows how a standard DP turbine is close-coupled to a low-speed gear using an integral turbine and pinion shaft. All shaded turbine parts are interchangeable on all sizes of DP turbines. Thus, it is easy to stock spares, and maintenance costs are reduced. All individual turbine models and gear sets have standard shaft heights for easy installation or re-location in your plant. In addition, standardization cuts manufacturing expense, and the savings are passed on to you in the form of extra features usually found only on "special" turbine-gear drives.

GENERAL ELECTRIC

ALCOA

Alcoa Heat Exchanger News

PUBLISHED BY ALUMINUM COMPANY OF AMERICA

ALCLAD TUBES...a bargain in corrosion resistance

If you are troubled by the corrosion effects of sulfur compounds, oxygen, or carbon dioxide in cooling waters, alclad tubes offer a long-lasting solution.

Alclad tubes have given long service life in many fresh, brackish, and salt waters where high industrial contamination exists. Alclad tubes withstand waters having a wide pH range.

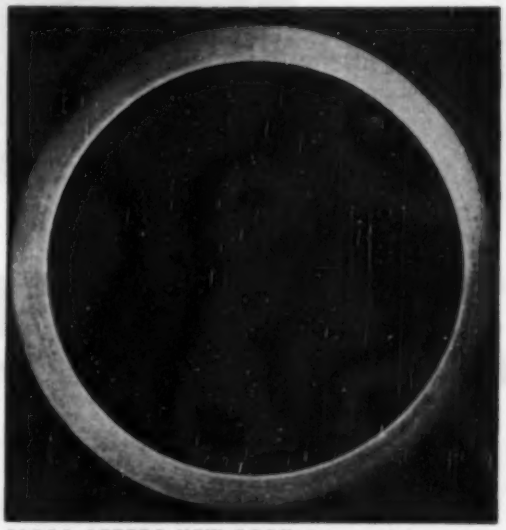
Coating Resists Corrosion

The zinc-aluminum alloy layer galvanically resists corrosion of the base aluminum alloy structure of the tube—acts like a "built-in" anode. Corrosion is confined within the integral cladding layer. Even when large areas of the alclad coating have been destroyed by electrolysis, the rest of the coating still continues to protect the exposed alloy core. Alclad tubes have withstood such corrosive attack for more than ten years, without failure.

Alclad Costs Little

The remarkable thing about alclad tubes are their low price. Foot for foot, metal for metal, they cost less than any other tubes except bare aluminum. Twenty per cent less than ordinary steel. Forty-seven per cent less than Admiralty. A sixth as much as stainless steel.

We'd like to tell you more about the savings possible with alclad tubes—amounting to thousands of dollars every month in many plants. Write to us. ALUMINUM COMPANY OF AMERICA, 1490K Gulf Building, Pittsburgh 19, Pennsylvania.



ALCOA OFFERS NEW BOOK This new, 24-page book will answer many of your questions about Alcoa tubes. It covers fabrication techniques, alloy selection, chemical and petroleum applications. It describes tube cleaning, inhibitors, cathodic protection. It contains complete information on fluid flow and heat transfer. There are formulas, tables, and specification data. Write for your free copy today. ALUMINUM COMPANY OF AMERICA, 1490K Gulf Building, Pittsburgh 19, Pa.

THESE APPLICATIONS ARE NATURALS FOR ALCLAD TUBES:

Petroleum

- Condensing of hydrocarbon fractions such as naphtha, gasoline, and gas oil
- Vapor-recovery condensers
- Lube-oil coolers
- Natural-gas compressor aftercoolers
- TCC overhead condensers
- Recompressor aftercoolers
- Hydrogen-sulfide gas coolers
- MEA-solution coolers and exchangers
- Furfural condensers and exchangers
- MEK service
- Propane chilling
- Wax sweaters
- Depropanizer overhead condensers

Chemical

- Butanol
- Ethanol
- Ethylene Glycol
- Glycerin
- Hydroabietyl
- Isopropanol
- Methanol
- Phenol
- Propylene Glycol
- Acetaldehyde
- Formaldehyde
- Acetic Acid
- Butyric Acid
- Stearic, Palmitic, Oleic Acids
- Recinoleic Acid
- Acetanilide
- Ammonia and Ammonium Hydroxide
- Hydrogen Cyanide
- Nitric Acid (concentrated)
- Pyridine
- Hydrogen Sulfide
- Benzene
- Benzol
- Dichlorobenzene
- Gasoline
- Gelatin
- Hydrogen Peroxide
- Methyl Ethyl Ketone
- Turpentine

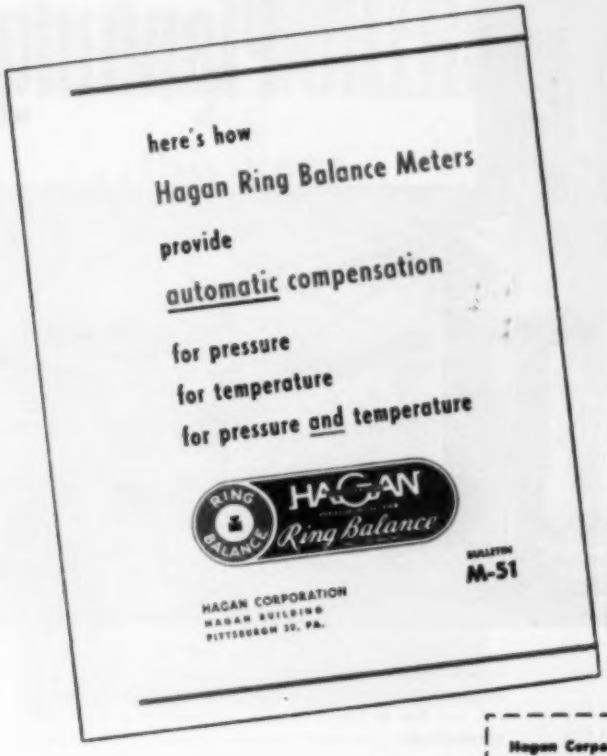
These listings cannot cover the many hundreds of other chemicals with which aluminum tubes can be used

AUTOMATIC COMPENSATION

for pressure or temperature
or BOTH
with

HAGAN

Ring Balance Meters



When actual pressure and temperature differ from the base conditions used in the orifice calculations, a "correction factor" must be applied to the readings of any conventional flow meter.

Hagan Ring Balance Compensated Flow Meters correct automatically for variations in temperature or pressure, or both. The chart reading is the compensated reading. The uncompensated record may also be produced on the same chart, as well as records of the flowing pressure and temperature.

The Ring Balance principle makes the addition of pressure and temperature compensation so simple that compensated meters are standard models in the Hagan Ring Balance line—not a special "problem child."

Detailed information on these meters is contained in our new bulletin "Here's How Hagan Ring Balance Meters Provide Automatic Compensation for Pressure, for Temperature, for Pressure and Temperature." To get your copy, just fill out the coupon below, or write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTOR FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

Hagan Corporation
Ring Balance Meter Division
Hagan Building, Pittsburgh 30, Pa.

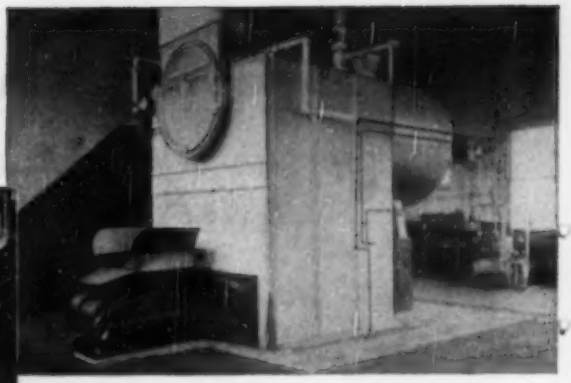
Please send me a copy of your new bulletin, "Here's How Hagan Ring Balance Meters Provide Automatic Compensation for Pressure for Temperature, for Pressure and Temperature."

NAME_____

STREET_____

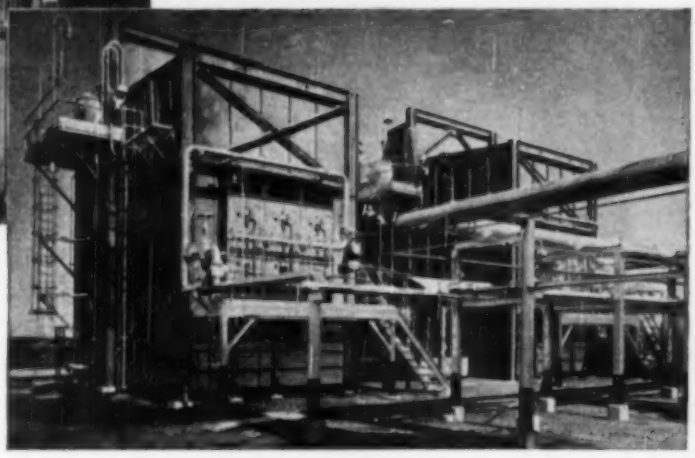
CITY_____ STATE_____

CE-10



Planning

Installation for medium and smaller plants . . . pressure to 475 psi . . . capacity to 60,000 lbs. of steam per hr . . . suitable for any type of fuel.



Installation for larger plants . . . pressure to 1000 psi . . . temperature to 900 F . . . capacity to 350,000 lbs. per hr . . . any fuel or type of firing . . . indoor or outdoor type construction.

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

Installation for small plants . . . pressure up to 150 psi . . . capacity to 12,000 lbs. of steam per hr . . . adaptable to any fuel.

? to buy BOILERS

. . . this year
. . . next year

Installation for special conditions including very limited space . . . quick steaming (full capacity in 3 min.) . . . fully automatic operation . . . capacity to 6000 lbs. of steam per hr . . . pressure to 300 psi. Ideal for intermittent load.

Sometime this year, or perhaps next, your company may decide to buy new boilers . . . to replace obsolete units . . . to meet increasing steam demands . . . or for a new plant. Whatever the time or circumstances, here's something it will pay you to remember. With fuel and operating costs firmly established at new high levels, today more than ever before, the first cost of a new boiler is decidedly secondary to the annual operating cost. In fact, the annual cost of fuel alone for the average boiler installation nowadays usually equals or exceeds the purchase price. And the normal life of a boiler should be 20 to 30 years, or longer.

Obviously, then, the operating economies accruing from better design, construction or application, will quickly offset the difference between the cheapest boiler you can buy and the best the market affords. Here is one case where the old adage "the best is the cheapest" really applies.

In addition to having installed thousands of industrial boilers . . . in every size category from less than 100 horsepower up . . . Combustion has designed and built many of the country's largest utility power station boilers. And it is in this field — the manufacturing of power on a large scale — that boiler design and construction are evaluated most critically and exhaustively.

The fact that C-E Boilers have been selected to meet the exacting performance standards of so many of the nation's largest utility power stations is evidence of the quality of design and construction you can expect to find in any boiler, large or small, that bears the Combustion nameplate.

Our recommendations as to the most suitable type of boiler and firing equipment for the *specific requirements* of your next installation are available to you and your consultants without obligation.

B-383A

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

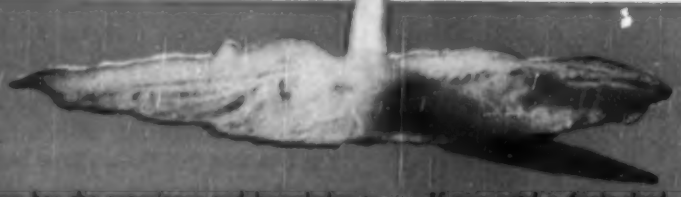
C-E

Davison Silica Gel

FINELY-SIZED SYNTHETIC SILICA

—for products or processes requiring non-crystalline silica of high purity—

—as small as .5 micron diameter average!



Davison has the experience and knowledge to chemically control silica gel production for precise uniformity of structure. Such silica gel characteristics as pore size, density and internal surface area are altered to assure maximum benefits in your application.

If you need a finely-sized, non-crystalline synthetic silica of high purity, write for information, specifications and samples of Davison silica gel. We will be happy to give you our recommendations based on experience and research. Mention your proposed application when writing.

Properties

- High purity
- Chemically and physically inert
- High adsorptive capacity
- Low density
- Free flowing
- Surface areas up to 1000 square meters per gram

Typical Uses

- Anti-caking agent in dyes, chemicals, foods, pharmaceuticals
- Decolorization of organic compounds
- Pigment extenders and flatting agents
- Dehydrating agent in aluminum paint
- Insecticide dilutents
- Increasing porosity of medicinal tablets
- Selective separation of pharmaceuticals and hydrocarbons

Typical Analysis on Dry Basis

99.71% pure SiO_2

Where cost of materials is a primary factor and constituent compounds will not affect your process, Davison silica gel can be supplied in less pure form. The material is also available in greater degrees of purity for extremely sensitive processes.

Also Producers Of
SILICA HYDROGELS
CATALYSTS
CALCIUM COMPOUNDS
ALUM
INORGANIC ACIDS
AGRICULTURAL CHEMICALS

Progress through Chemistry

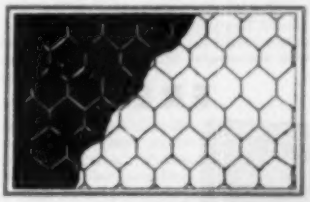
THE DAVISON CHEMICAL CORPORATION
BALTIMORE 3, MD.

What's wrong with this picture?

This man has buried chicken wire reinforcement under the insulating cement on the outdoor tank shown above. Now he's trowelling a weatherproofing finish over the cement. While this method provides a smooth and attractive surface, the reinforcing does only half its job. It strengthens the cement, but it offers no grip to the weatherproofing finish that is being applied over it.

The wire should be applied after the cement has been troweled on. Then the wire will serve as added support for the cement and will bond Armstrong's Insulmastic finish firmly to the surface.

In most heat insulation jobs, a smooth, neat finish is a good indication of expert, efficient application. This is one exception. When an Insulmastic finish is applied to large areas, a slightly "waffled" appearance of the completed job indicates a strong bond and promises longer service.



NOT SO SMOOTH, but much stronger, the right application of chicken wire reinforces both the asbestos cement and plastic weatherproofing finish.

For the money you spend on a heat insulation contract, you have a right to expect close attention to every detail of the job. All the men in the Armstrong organization—engineers, superintendents, foremen, and workmen—take pride in handling each detail in the right way. They know how important this is to the performance of the insulation and to our reputation for good workmanship. The next time you buy a heat insulation contract, find out how this extra care gives you more for your money. Call the engineer in the Armstrong office nearest you or write direct to Armstrong Cork Company, 3310 Maple Avenue, Lancaster, Pennsylvania.

ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS - INSTALLATION

FOR ALL TEMPERATURES FROM 300°F. BELOW ZERO TO 2800°F.

For Your Information

MONSANTO PLASTICS

Every month, thousands purchasers have pages of pertinent information. Here you will find suppliers and application ideas selected to help you improve your products, lower your production costs, increase your sales. More information will gladly be furnished on request.

Here's the easiest way to solve your plasticizer problems

CALL ON MONSANTO . . . . FOR TECHNICAL SERVICE . . TO SOLVE YOUR PROBLEM

Monsanto Technical Service is available . . . without cost . . . to users of plasticizers

If a vinyl plasticizer problem rears up while you're developing a new product, improving your present line or seeking ways to cut costs or speed up processing, don't let the problem get you down. Call on Monsanto Technical Service and solve your difficulty as easy as 1 . . . 2 . . . 3.

1. Monsanto's fully-equipped application laboratory will work for you without cost or obligation. Write, wire or phone and tell us your troubles. We will save you the initial work by recommending a *proved* formulation. Or, the Monsanto Technical Service Staff will work out a tailor-made formulation for you. If necessary, and if you desire it, a specialist will work with you *in your plant*.

2. Monsanto Santicizers are the world's most complete line. With this *complete* vinyl plasticizer line at their command, our technicians can recommend *exactly* the right plasticizer, or combination of plasticizers, *you* need.

3. Your problems are solved so you gain the advantages of improved products, lowered costs or more efficient processing. For further information on this *confidential* Monsanto service to users of plasticizers, mail the coupon or get in touch with the nearest Monsanto Sales Office.

FREE

Details on the world's most complete line of vinyl plasticizers, plus technical information of value to plastics manufacturers, are yours in the 80-page book, "Monsanto Plasticizers." Mail the coupon for your *free* copy.

Carpet cleaner becomes germ killer by addition of Monsanto Santophen 1

The list of formulators who are incorporating Monsanto's Santophen * 1 in their floor and carpet cleaners is growing by leaps and bounds. There are several important reasons, in addition to its low cost, why there is an increasing preference for Santophen 1. Here are some of them:

Santophen 1 reduces bacteria count drastically. In one instance a rug cleaner containing Santophen 1 cut the bacteria count in carpet from 8,000,000 per square yard to 16 per square yard.

Santophen 1 is compatible with commonly-used soaps and synthetic detergents.

When properly formulated, Santophen 1 retains its bactericidal activity in commercial cleaners.

Santophen 1 controls mildew.

Santophen 1 is safe and convenient to handle, (a) formulated, (b) by itself.

Many formulations containing Santophen 1 have been registered with the U. S. Department of Agriculture.

If you want more information on the use of Santophen 1 in cleaning compounds or for any germicidal uses, mail the coupon.

NEW DATA on Monsanto's flavor and aroma chemicals

New solubility data on Monsanto's Ethavan, * vanillin and coumarin are available in three recently revised folders. Folders also contain information of interest to industries that use such chemicals for flavoring, as aromas or for masking undesirable odors and tastes. Mail the coupon for your *free* copies of these folders.

Inhibitor 038 stops corrosion, protects products and containers

Inhibitor 038 protects steel containers from corrosion when it is added to most nonaqueous solvents and solutions. It guards such products against picking up dissolved metal and permits shipment in metal instead of in glass or wood. For details write Monsanto, Everett Station, Boston 49, Massachusetts.

Plasticizer storage data

If you are interested in bulk tank storage of plasticizers, mail the coupon for a free copy of Monsanto Bulletin No. O-69.

TWO INTERMEDIATES WORTH INVESTIGATING

Here are two intermediates that already have usage in the manufacture of dyestuffs and pharmaceuticals. However, it is believed these products may have a much wider range of applications. Read the information given below. If you see possible use in your work, send for samples.

meta-CHLOROANILINE

Formula: **Mol. Wt.: 127.57**

Properties:
Clear light-yellow liquid
Assay, 99% Min.
Crystallizing Point — minus 10.6° C. Min.
Distillation Range — 228° C. start, 231° C. dry point, 95% within 1.0° C.

Reactions:
Undergoes typical reactions of aromatic amines such as diazotization, acylation and alkylation. Reacts with CS_2 to give substituted thiourea and condenses with aldehydes.

Suggested Uses:
As an intermediate in the manufacture of azo dyes and pharmaceuticals.

meta-CHLORONITROBENZENE

(meta-Nitrochlorobenzene)

Formula: **Mol. Wt.: 157.56**

Properties:
Greenish-yellow crystalline mass
Crystallizing Point — 43.9° C. Min.

Reactions:
Can be reduced to meta-chloroaniline and other intermediate products.
Can be further chlorinated, nitrated or sulfonated.

Suggested Uses:
As an intermediate in the preparation of dyestuffs and pharmaceuticals.

Looking for nontoxic plasticizer? Here are three with BAI's O.K.

If a nontoxic plasticizer will aid you in creating new products or improving ones now in your line, look into Monsanto Santicizer* 141, Santicizer B-16 and Santicizer E-15. All of these have been accepted as nontoxic by the Bureau of Animal Industry, U. S. Department of Agriculture.

Often, of course, you'll want to combine various other properties with nontoxicity in order to get the qualities you want in finished products. Monsanto, with the world's most complete line of plasticizers for polyvinyl chloride, can supply the right plasticizer to solve your problem.

AROCLOR 1248 . . . efficient, nonflammable liquid-phase heat-transfer medium

Monsanto's Aroclor* 1248 (chlorinated biphenyl) is a nonflammable liquid-phase heat-transfer medium for operations up to 300° C. (572° F.) that delivers both efficiency and safety. Aroclor 1248 has been used successfully for many years in industrial plants.

Aroclor 1248 has operated in gas-fired units ranging in capacity from 200,000 to 400,000 b.t.u. per hour. Commercial installations, with capacities up to 2,000,000 b.t.u. per hour and small electrically-heated stationary and portable units, with capacities around 40,000 b.t.u. per hour, have given excellent service with Aroclor 1248. Nonflammable and noncombustible qualities of Aroclor 1248 have been established thoroughly by scientific tests. The spontaneous ignition temperature of Aroclor 1248 is 704° C. or 1299° F. This is well above practical requirements for operating units at 300° C. In spray tests, it was found that Aroclor 1248 required 64% oxygen for combustion. Fluids requiring over 45 to 50% oxygen in the spray test failed to cause fire in incendiary tests.

Monsanto, maker of Aroclor 1248, does not manufacture heating units, but will gladly refer you to concerns which produce such units. For details, mail the coupon for Technical Bulletin No. P-130, or contact the nearest Monsanto Sales Office.

Santomerse No. 1, efficient, all-purpose detergent-wetter

To name each specific use for Monsanto Santomerse* No. 1, the all-purpose detergent and wetting agent, would take considerable time and space. Broadly speaking, Santomerse No. 1 is worth investigating in any operation requiring a detergent, wetter, penetrant, emulsifier or dispersant.

Santomerse No. 1 is an alkyl aryl sulfonate compound with a minimum of 40 per cent active ingredient. It is an efficient detergent, which makes abundant suds in hard or soft, hot or cold water. It is effective in acid or alkaline solutions.

For further information on Santomerse No. 1, mail the coupon.

FOR YOUR LIBRARY

Timely Monsanto publications, listed below, will be sent free to users of chemicals. Use the convenient coupon to indicate the items you want.

* * *

Bulletin No. O-63—Laboratory and field studies of para-dichlorobenzene as a volatile fungistat.

* * *

Technical Bulletin No. O-D-601—Flame-resistant hydraulic fluid, OS-16.

* * *

Technical Bulletin No. P-28—Fire Retardant B for textiles.

☆ ☆ ☆

MONSANTO CHEMICAL COMPANY, 1703-K South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

SEND INFORMATION: ☐ Santophen 1. ☐ Aroclor 1248. ☐ Inhibitor effi. ☐ Santomerse No. 1. ☐ Santicizers 141, B-16, E-15. ☐ Plasticizer Technical Service.

SEND LITERATURE: ☐ Bulletin No. O-63. ☐ Bulletin No. O-69. ☐ Bulletin No. O-D-601. ☐ Bulletin No. P-28. ☐ Bulletin No. P-130. ☐ Folder, Ethavan. ☐ Folder, Vanillin. ☐ Folder, Coumarin. ☐ Book, Monsanto Plasticizers.

SEND SAMPLES: ☐ meta-Chloroaniline. ☐ meta-Chloronitrobenzene.

MONSANTO CHEMICAL COMPANY
1702-K South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, material indicated at the left.

Name..... Title.....

Company.....

Street.....

City..... Zone..... State.....

Get All-Around Motor Protection with

SAFETY-CIRCLE

THAT SOLID CAST IRON FRAME protects *Safety-Circle* working parts against physical damage from every angle. The completely enclosed bottom provides extra protection and extra strength. End brackets are drip-proof at no premium.

Because the frame is cast iron, it is resistant to rust and corrosion. It withstands physical abuse and will not distort.

Protected Inside, Too

Safety-Circle protects against internal breakdown with multiple-dipped and baked stator and die-cast aluminum rotor. *Ball bearings are factory-lubricated and need no attention for years.* Wide open internal construction and large fans keep temperatures well within rated limits.

Don't be satisfied with a motor that gives you less than full protection. Insist on the extra protection of *Safety-Circle*.

For complete details on *Safety-Circle* advantages, see your A-C Authorized Dealer, Sales Office, or write for Bulletin 51B6210B. Sizes from 1 to 20 hp, 326 frames and smaller.

A-3145

Safety-Circle, Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS, 1147A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ½ in. to 72 in. discharge and up.

ALLIS-CHALMERS

PICCO HEAVY OILS

A group of aromatic, high-boiling oils having these characteristics →

- ★ **HIGH SOLVENT POWER**—similar to high solvency naphthas
- ★ **BOILING RANGES**—available within distillation range 230°C-375°C. (450°F-700°F)
- ★ **COLORS**—from light amber to dark brown
- ★ **LOW VISCOSITY** and good cold test (20°-30° below zero F)

Typical Applications Include:

Weed-killing oils, tar cutback, solvent for asphalt varnishes, plasticizer and softener for other synthetic resins, coal spray, pitch cutback, fuel viscosity adjuster, insecticide and disinfectant solvent, creosote extender, railroad bed dressing, sludge solvent and many other uses.

WRITE for samples and bulletin.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.
Clairton, Pennsylvania

Plants at CLAIRTON, PA.; WEST ELIZABETH, PA.; and CHESTER, PA.

Sweet's File

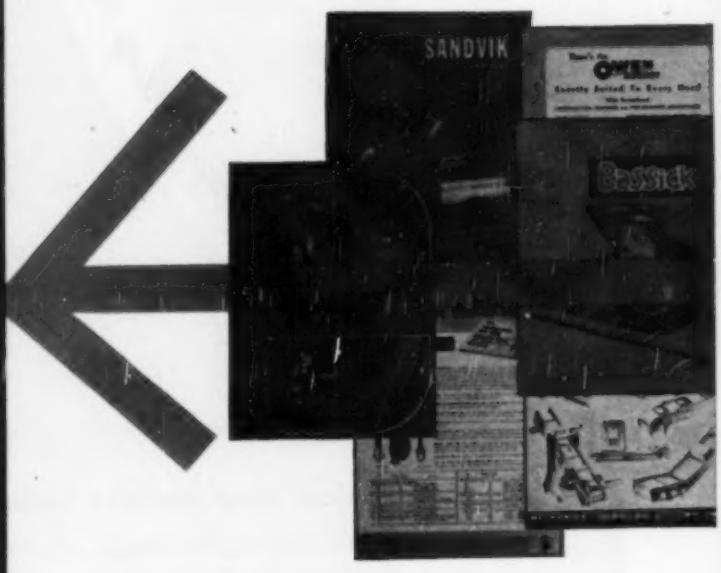
S

process industries

processing equipment 1
mechanical equipment 2
electrical equipment 3
materials 4
structural equipment 5
plant utilities 6
service equipment, special services 7

1950

looking for material handling



equipment?

roach for Sweet's . . . All these manufacturers' catalogs, covering all types of conveyors, hoists, lifts, trucks, tractors, collectors, scales, vibrators, shakers, screens, mixers, ditchers, clarifiers, driers, coolers, storage systems, and control, accessory and auxiliary equipment for them, are instantly available in Section No. 2a of your Sweet's File for the Process Industries.

The other sections of this Sweet's File contain additional catalogs covering a wide range of materials and equipment—useful and up-to-date information on product forms, characteristics, performance and use.

This grouping of manufacturers' catalogs, in sections according to products or use of products, is made for your convenience, so that you can readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly and easily to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want, please tell us.

Sweet's catalog service

DIVISION OF F. W. DODGE CORPORATION

119 WEST 40TH STREET • NEW YORK 18, N.Y.

NOW! FOR THE FIRST TIME

*for motors up to 2250 hp**

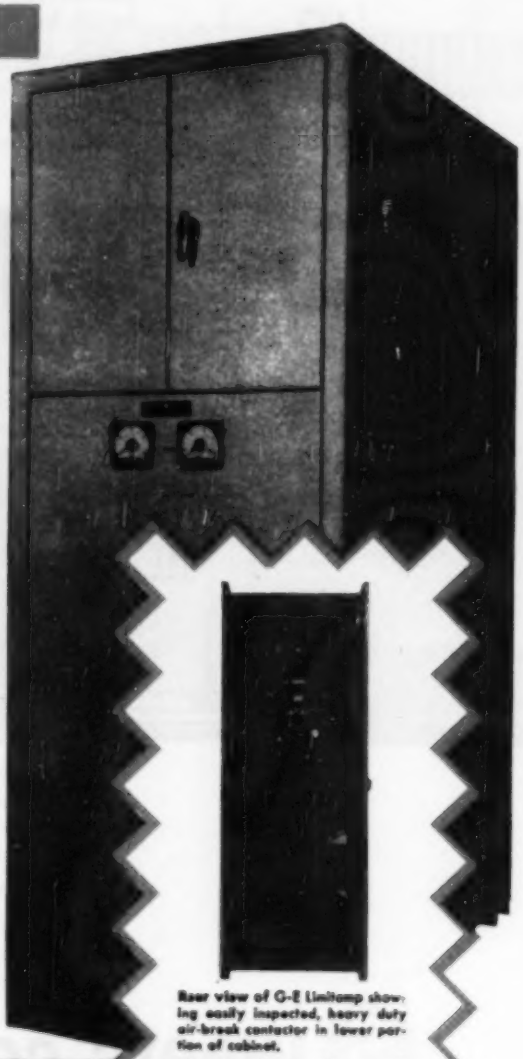
LIMITAMP HIGH-VOLTAGE CONTROL

This G-E Limitamp motor controller with a new 400-amp air-break contactor is pre-engineered, factory assembled and tested—with all the control and motor protection you need in one steel enclosure.

Current-limiting EJ-2 fuses provide short-circuit capacity up to 250,000 kva. Air-break contactors are good for millions of operations with only routine maintenance, so Limitamp control is recommended especially for motors on severe duty cycles. Low first cost (only $5300** for 2250-hp synchronous motor control) as well as continuing savings because of low operating and servicing costs, make this an economical buy.

Available for 2300-volt motors up to 1250 hp, and 4800-volt motors up to 2250 hp. Ask your nearest G-E sales engineer for more information on the new 400-amp size, or write for Bulletin GEA-5409 for details on G-E Limitamp control. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

*2500 hp for 1.0 pf synchronous motors.
**List price. Subject to change without notice.



Rear view of G-E Limitamp showing easily inspected, heavy duty air-break contactor in lower portion of cabinet.

GENERAL ELECTRIC

all PARAGON PRODUCTS are protected

in drums equipped with Tri-Sure Closures

- Motor Oils
- Gasoline
- Diesel Lubes and Fuels
- Solvents
- Industrial Lubricants
- Anti-Freeze
- Gear Lubricants
- Specialties

LED BY Paralene 100% Pennsylvania Motor Oil, a varied line of petroleum products is shipped from the plant of the Paragon Oil Company, New York. And every drum of every Paragon product is equipped with Tri-Sure Closures*.

In 1932, Paragon adopted the Tri-Sure Closure to give their oils security from losses—and since that time, shipment after shipment has proved that Tri-Sure protection is *reliable* protection from leakage, seepage, pilferage and substitution.

The Tri-Sure flange is an integral part of the drumstock—as strong as the drum itself. Into the flange the plug is screwed securely. And crimped strongly over the flange is the heavy-gauge, leak-proof seal which cannot be removed unless it is deliberately destroyed.

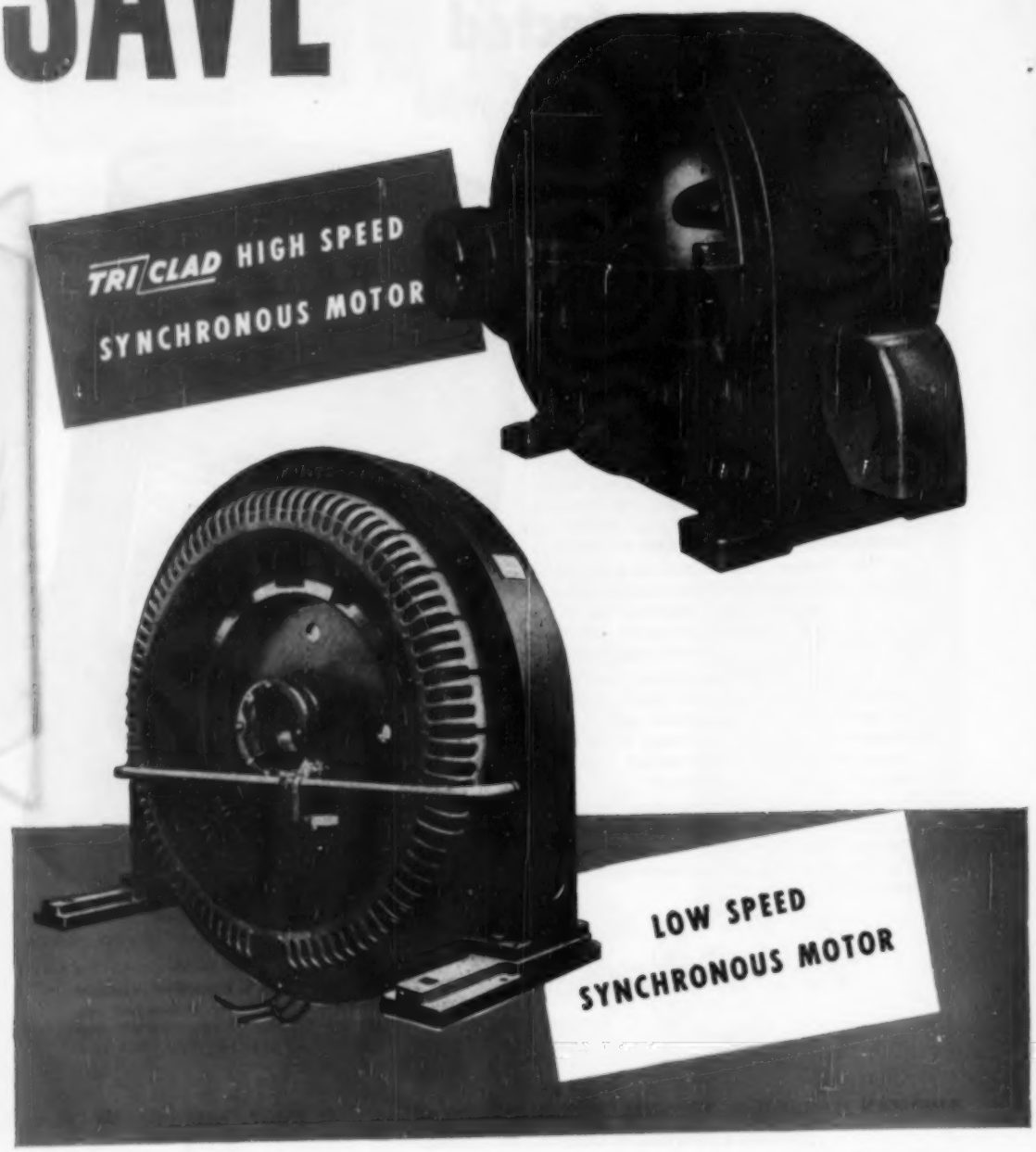
This exclusive Tri-Sure construction—the soundest insurance against leakage and losses—is why Paragon and other companies who have been Tri-Sure users for years *continue* to specify "Tri-Sure Closures".

Tri-Sure
CLOSURES

**The "Tri-Sure" Trademark is a mark of reliability backed by 28 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.*

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

SAVE ON POWER BILLS



WITH GENERAL ELECTRIC SYNCHRONOUS MOTORS

SYNCHRONOUS MOTORS IMPROVE POWER FACTOR

1. **Save you penalty charges for poor power factor**

2. **Save money by reducing demand and releasing needed generating capacity**

Here's an example:

One company improved power factor from 72 to 84 per cent by installing a 300 hp .8 leading power factor G-E synchronous motor in place of another motor. This corrected power factor released 260 kva capacity in their generating equipment and allowed installation of additional motors.

These savings in cost of operation are available to you.

Savings in the initial cost of equipment are also available—when synchronous motors are used in their natural fields of application. To find out about these natural fields of application, get in touch with our nearest office.

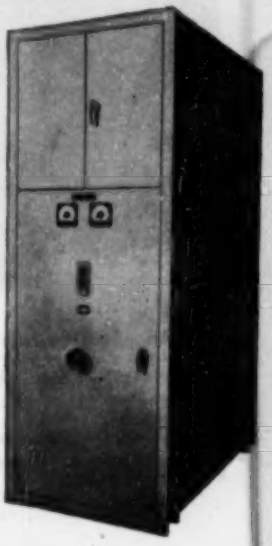
REMEMBER—General Electric Synchronous motors—whenever you need constant speed. They can give you lower initial cost, lower operating cost. For bulletin information, fill in the coupon

G-E SYNCHRONOUS MOTOR CONTROL INCREASES YOUR SAVINGS

G-E synchronous control provides the accurate adjustments that enable you to improve power factor. Here's where details count—where the slightest variation of a pointer on a meter means money saved—or lost. And General Electric has not overlooked these elements. Consider the meters for a moment. Here, G-E has devised a long scale with the pointer in the same plane as the figures so there can be no possibility of misreading the instrument. Anti-glare glass is used so no distortion is possible.

The new smaller rheostat, too, has design features that not only result in longer life but in greater operating convenience and accuracy. The handle has been molded to fit the fingers of the operator—to prevent slippage and over correction. You can be sure, too, that the new field circuit will respond instantly to rheostat adjustment.

Protection is assured the operator through the attractive steel enclosure. The cabinet resists blows, keeps out dirt and other operating hazards. All live parts are strongly guarded. Plant appearance is improved with this control designed to line up with other G-E power units such as switchgear. Ask your nearest G-E office for more information about this equipment that safeguards your investment . . . helps save operating expenses.



GENERAL ELECTRIC

Apparatus Dept., Sec. Q770-6
General Electric Co., Schenectady, N. Y.

Gentlemen:

Please send me: ☐ GEA-5332, Low-speed Synchronous Motors; ☐ GEA-5436, High-speed Synchronous Motors; ☐ GEC-805, Synchronous Motor Control.

Bulletins needed for:
☐ Reference purposes ☐ Planning immediate project

Name .....

Position .....

Address .....

City ..... Zone ..... State .....

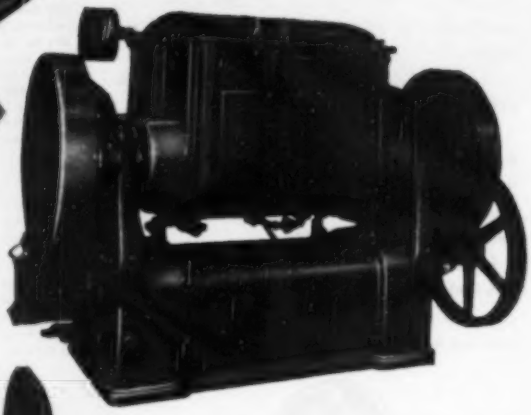
THREE NEW BAKER PERKINS MACHINES FOR BETTER CHEMICAL PROCESSING

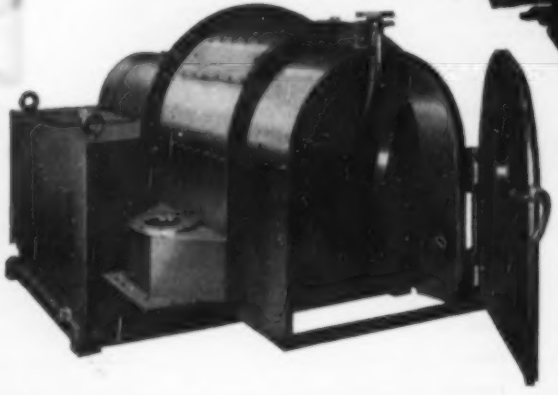
TYPE HS-36 BAKER PERKINS "ter meer" UNIVERSAL CENTRIFUGAL for filtering solid-liquid slurries.

- Capacity — 4500 lbs. per hr. (Dependent on material)
- Drum speed 1000 x G.
- Drum diameter — 36 inches
- 20 HP Single Motor Drive
- Construction as desired . . . alloy, rubber lined or iron and steel. Either fume or vapor tight.
- Fully automatic with cycle controller that handles every centrifugation cycle.

SIZE 16 JYEM2 UNIVERSAL MIXING AND KNEADING MACHINE for wide variety of chemical processing operations.

- Capacity 150 gallon working, 225 gal. total
- Sigma-type blades of cast steel
- 50 HP single motor drive
- Trough of fabricated steel jacketed for 80 lb. steam pressure.
- Vaulted, hinged and counterbalanced vapor-tight cover with quick opening clamp





SIZE S-15 BAKER PERKINS "ter meer" CONTINUOUS CENTRIFUGAL for centrifugation of free draining crystalline, granular and fibrous materials of all types.

- Capacity — 6000 lbs. per hr. (Dependent on material)
- Drum speed — 450 X G Constant speed
- 20 HP single motor drive
- Drum diameter 15 inches
- Operates with continuous feed and discharge
- Lower Power input.

BAKER PERKINS INC., CHEMICAL MACHINERY DIVISION, SAGINAW, MICHIGAN

For cost-saving installations
SPECIFY
B&W STAINLESS PIPE

. . . because of its ease of fabrication, and because you can obtain the grade and type required by service conditions.

Call on your B&W Tube Representative about your stainless pipe requirements. He is factory trained . . . he sells only tubing . . . his specialized knowledge may help you uncover economies in buying and applying any stainless tubular products.

FOR
SANITATION
●
CORROSION RESISTANCE
●
HIGH AND LOW
TEMPERATURE STRENGTH
●
IN THE
PROCESS INDUSTRIES

TYPES—Seamless and Welded.

GRADES—Complete range of austenitic and ferritic stainless steels.

SIZES—Through 8" in all schedules.

SPECIFICATIONS—ASTM, ASME, U. S. Government, and others for special applications.

Suitable for coiling, bending, flanging, welding, and other such fabricating operations.

Write for Bulletin TB-332, "B&W Stainless Pipe."

THE BABCOCK & WILCOX TUBE COMPANY
General Offices: Beaver Falls, Pa.
Plants: Alliance, Ohio, and Beaver Falls, Pa.
Sales Offices: Alliance, Ohio • Beaver Falls, Pa. • Boston 16, Mass. Chicago 3, Ill. • Cleveland 14, Ohio • Denver 2, Colo. Detroit 26, Mich. • Houston 2, Texas • Los Angeles 15, Calif. New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. San Francisco 3, Calif. • Syracuse 2, N. Y. • Toronto, Ontario Tulsa 3, Okla. • Vancouver, British Columbia

B&W SEAMLESS and WELDED TUBES and PIPE

Wool and the ULTRAWETS

From raw wool to finished sweater . . . much of the processing involved can be improved by using the ULTRAWETS—a family of alkyl aryl sulfonates tailor-made for particular jobs. For example:

IN CARBONIZING RAW WOOL: The problem of finding an economical low foaming wetting agent which is stable to acid to facilitate the removal of the cellulosic impurities from the raw wool is solved by using liquid ULTRAWET 30E or ULTRAWET 30DS.

IN SCOURING RAW WOOL, YARN, AND PIECE-GOODS: Liquid ULTRAWET 35KX is the most economical alkyl aryl sulfonate for volume use. Flake ULTRAWET K or bead ULTRAWET SK where dried products are desired.

IN DYEING: The liquids ULTRAWET 30E and ULTRAWET 30DS are particularly efficient as dye leveling agents.

Wool is just one of the textile fibers with which the ULTRAWETS are being used. They are equally important in the processing of cotton and synthetic fibers. We'll be glad to send you a brochure which will give you the facts about the whole ULTRAWET family. The Atlantic Refining Company, Chemical Products Section, 260 S. Broad St., Philadelphia 1, Pa.

ATLANTIC
PETROLEUM
CHEMICALS

In the East
THE ATLANTIC REFINING COMPANY
Philadelphia • Pittsburgh • Providence
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NAUGATUCK CHEMICALS
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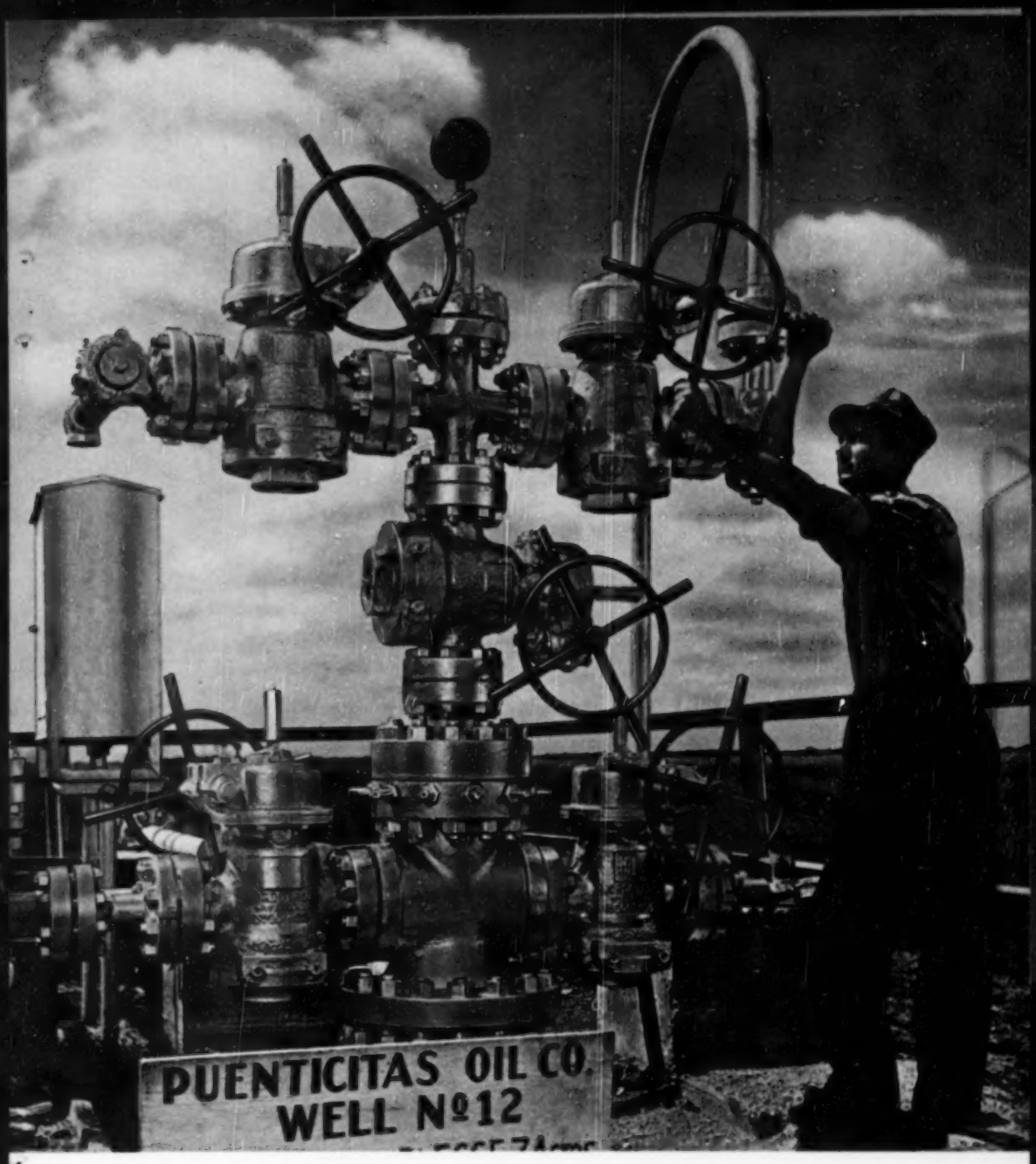
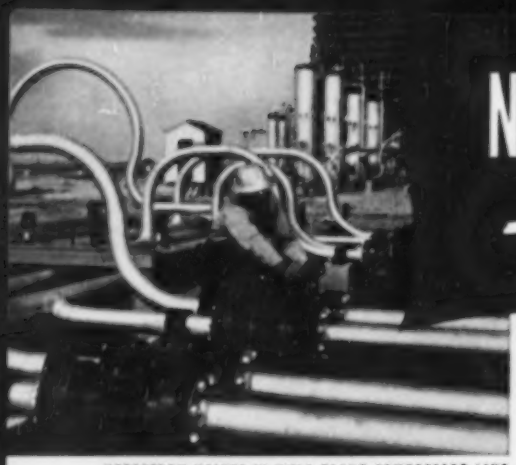


It's a pleasure to operate a Nordstrom valve. Smooth rotary movement instead of dragging action across seat rings insures easiest operation. An entire battery of Nordstroms can be opened or closed within a few minutes, in contrast to hours for some other types. There's no tug or toil to tighten or "break open" a Nordstrom, because the rotary, tapered plug is seated on lubricant, sealed by lubricant and jacked by lubricant.

Nordstrom

AUTOMATICALLY LUBRICATED VALVES

Nordstroms fit the Need
—*Unsurpassed*



NORDSTROM VALVES IN FIELD PLANT COMPRESSOR LINE

NORDSTROM MUDLINE VALVES ON OFF-SHORE DRILLING BARGE

FIELD PRODUCTION MANIFOLD, NORDSTROM EQUIPPED

NORDSTROM VALVES ON CONNECTIONS TO MAIN GAS HEADER

NORDSTROM VALVES IN MAIN GAS COMPRESSOR STATION

Nordstrom Valve Division — **ROCKWELL MANUFACTURING CO.**
400 North Lexington Avenue, Pittsburgh 8, Pa.
District Offices in all principal cities

Nordstrom VALVES

Export - Rockwell Manufacturing Co., International Division, 7701 Empire State Building, New York 1, New York

4 good reasons why you should use D-40 detergent

FOR WETTING, FOAMING, CLEANING AND COMPOUNDING

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

OTHER ORONITE PRODUCTS:

Polybutenes • Cresylic Acids
Naphthenic Acids
Sodium Sulfonates
Purified Sulfonate
Phthalic Anhydride
Gas Odorants
Wetting Agents
Quaternary Compound ATM-50
Ortho, Meta, Para Xylene
Xylol • Benzol
Lubricating Oil Additives
Aliphatic Acid
Hydroformer Catalyst
Dibutyl Phthalate

D-40's superior cleaning action easily gets the dirt, yet D-40 is neutral and will not harm the finest fabrics.

D-40's *low wetting and penetrating* action and its remarkable stability over a wide range of pH conditions have proven helpful in a variety of industrial applications from fruit washing to dye leveling.

D-40's *abundant foam* will add "life" to any compound, yet for special purposes, the foam can easily be eliminated.

D-40 in new white color, designed to suit any industrial, compounding or repackaging requirement, is now available in three particle sizes: *flakes—granules—powder.*

Oronite's Detergent *Raw Materials* are available in forms to fit the requirements and resources of all possible users. (1) *Alkane*, a clear, water-white alkyl aromatic hydrocarbon. Available to primary manufacturers of quality detergent products as a base stock for sulfonation. (2) *Detergent Slurry*, the sulfonated derivative of Alkane. A paste-like product for use in many cleaning applications or as a base for further compounding and drying. (3) *Dry Detergent D-40 and D-60*, the dry products from Oronite Detergent Slurry.

Ask for complete industrial information from your nearest Oronite office.

ORONITE CHEMICAL COMPANY

200 SANSOME ST., SAN FRANCISCO 4, CALIF.
STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
and 1 SOUTH MICHIGAN AVENUE, CHICAGO 3, ILL.
630 WHITNEY BLDG., NEW ORLEANS 12, LA.

★ An organization that has to its credit experience in every field of Engineering and Construction

BECHTEL CORPORATION

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"BUILDERS FOR INDUSTRY"

DESIGN • ENGINEERING • CONSTRUCTION

HOTTER, SOONER steam traps.. knock cold spots out of platens

Cold spots in press platens at this large western plywood plant are a thing of the past since they've installed the steam traps that get equipment *hotter, sooner*—Yarways.

Yarway Impulse Steam Traps never allow condensate to accumulate and pull down working temperatures. They discharge the condensate *as fast as it forms.* Result—equipment always operates at highest efficiency.

Couple this fact with other features like small size, easy installation, only one moving part, non-freezing, good for all pressures, low cost—and you know why more than 650,000 Yarway traps have already been installed.

Try a Yarway *for free* in your own plant. Your nearest distributor will supply it. For name, or free bulletin write to . . .

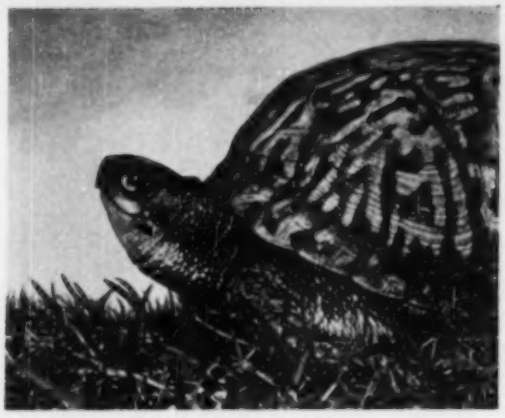
YARNALL-WARING COMPANY
137 Mermaid Ave., Philadelphia 18, Pa.

Stainless Steel Body

YARWAY **IMPULSE STEAM TRAP**

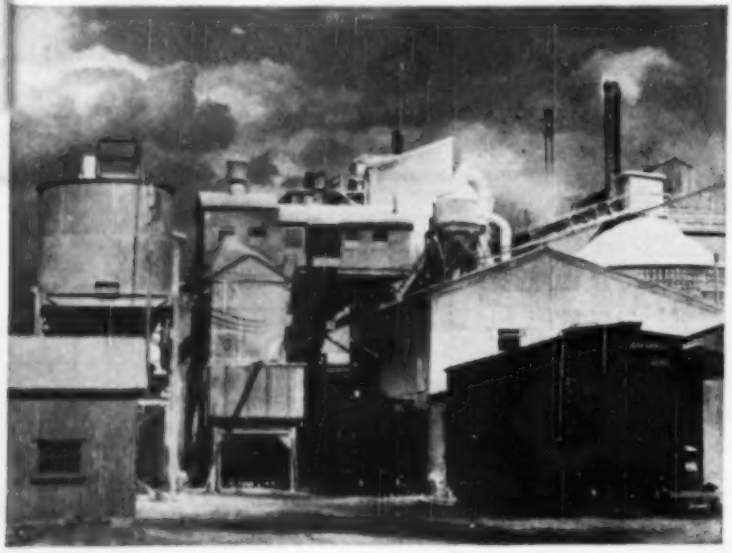
Life ...on the

ONE OF THE USES OF Cyanamid's AERO* Brand Guanidine Carbonate is to preserve the free-flowing characteristics of soap powders and other granular-type detergents which tend to cake or "lump" in storage. This use is just one of the many interesting applications being developed for the new guanidine compounds now commercially available from Cyanamid. Further information and technical data on these newer nitrogen derivatives is available on request. The coupon is for your convenience.



LOOKING FOR A HARD, DURABLE PROTECTIVE COATING to give long, useful life? The paint industry is finding one answer in modern surface coatings formulated with resins made from AERO* Brand Phthalic Anhydride which impart extreme hardness, toughness and durability to the protective film.

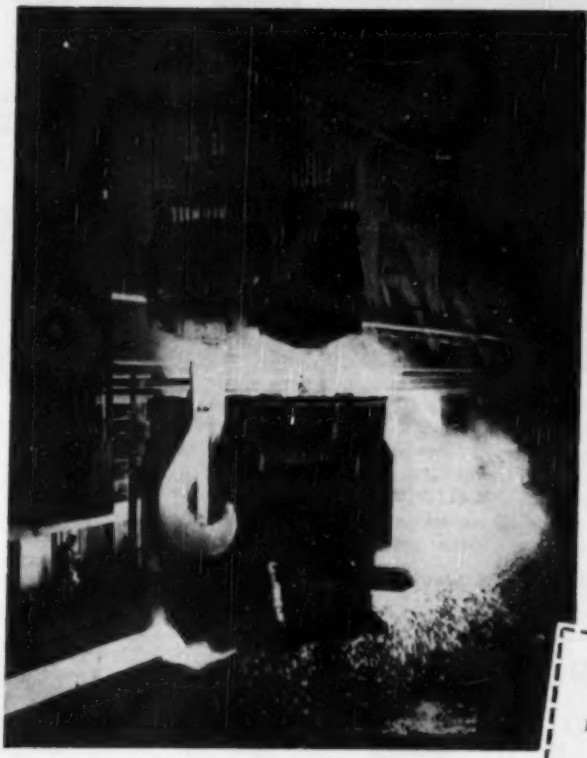
Other major uses of Phthalic Anhydride include the manufacture of chemical plasticisers, vat dyes and phthalocyanine pigments. As one of the leading producers of this basic chemical, Cyanamid will welcome your inquiry.



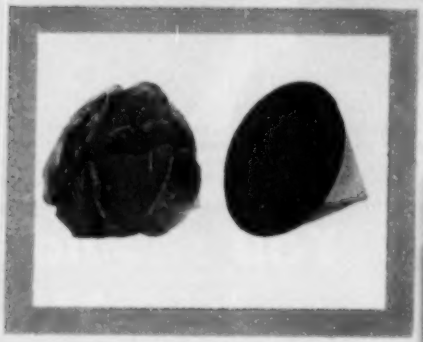
"A RAINCOAT FOR CEMENT" is one way to describe the action of AERO* Brand Calcium Stearate in waterproofing specialty cements. Also of interest to cement manufacturers is the fact that in addition to increasing water resistance in specialty cements, Calcium Stearate is also widely used for cutting grinding time and reducing caking in the bag. Calcium Stearate is also used in the manufacture of cement paints to increase their waterproof qualities.

*Trade-mark

Chemical Newsfront



STRENGTHENING THE SINEWS OF STEEL—that's the job Calcium Cyanamid 6-16 accomplishes when used to add nitrogen to steel. Only small amounts are needed to make tons of steel harder . . . to improve stiffness, corrosion resistance, and machinability. These advantages plus other features, such as freedom from dust and convenient packaging in paper bags, have made Calcium Cyanamid 6-16 a favorite in the manufacture of open hearth steel.



CRAZE-RESISTANCE is not a term of the psychiatrist, but instead, of the adhesives expert. It describes the ability of an adhesive to resist cracking and crumbling after it has set. URAC® 185 Resin Adhesive, shown at the right in the photograph, has this characteristic to a high degree. The ordinary type urea glue shown at the left does not. To receive literature describing URAC 185 more fully, check the attached coupon and send it in today.

American Cyanamid Company
Industrial Chemicals Division
30 Rockefeller Plaza, New York 20, N. Y.

C.E.—10-50

Please send information on the items checked.

- ☐ AERO® Brand Guanidine Carbonate
- ☐ AERO® Brand Phthalic Anhydride
- ☐ AERO® Brand Calcium Stearate
- ☐ Calcium Cyanamid 6-16
- ☐ URAC® 185 Resin Adhesive

Name _____ Position _____

Company _____

Address _____

State _____

AMERICAN Cyanamid COMPANY

30 ROCKEFELLER PLAZA NEW YORK 20, N. Y.

No. 47 **Boiler Water Feeder** — for hand-fired steam heating boilers up to 5000 sq. ft.

No. 47-2 **Feeder - Cut - off Combination** for automatically fired steam heating boilers up to 5000 sq. ft.

No. 147 **Boiler Water Feeder** — Similar to No. 47, but with higher feeding level for process steam boilers.

No. 247 — Same as No. 47, but for installation with 1" equalizing pipes.

No. 51-2 **Feeder Cut-off Combination** — Similar to No. 51-2, but built for higher pressure, up to 75 lbs..

No. 51 **Boiler Water Feeder** — for hand fired steam heating boilers over 5000 sq. ft.

No. 51-2 **Feeder - Cut - off Combination** — for automatically fired steam heating boilers over 5000 sq. ft.

No. 67 **Low Water Fuel Cut-off** — for low pressure steam boilers of any size.

No. 150 **High Pressure Pump Control, Cut-off and Alarm** — for steam boilers of any size up to 150 lbs. pressure.

No. 157 **Water Column Type High Pressure Pump Control, Cut-off and Alarm** — for steam boilers of any size up to 150 lbs. pressure.

You should know ALL of these McDONNELL PRODUCTS

• You are probably familiar with the more commonly used McDonnell Products. But for those jobs you may run across from time to time that call for special equipment, you should be familiar with *all* the McDonnell liquid level controls, flow switches, and similar products listed here. They are all evidence of how intensively McDonnell has worked at "DOING ONE THING WELL." We will be glad to give you information and counsel on any special application that may arise.

McDONNELL & MILLER, INC., 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

No. 101 **Electric Water Feeder** — operated by No. 67 or liquid level switches.

No. 33 **Safety Relief Valve** — for hot water heating boilers. Btu. rated. ASME standard.

No. 8-2 **Flow Switch** — Completes (or breaks) circuit when flow starts or stops.

No. 21

No. 121

No. 321

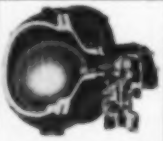
No. 421

Make-up Water Feeders—to maintain adequate water supply in receiving tanks. Nos. 21, 121 and 321 are installed right in tank openings; available in various flange forms and sizes as shown to fit existing openings. No. 421 is for external application, with equalizing piping.

No. L-8 **Constant Level Valve** — Maintains constant fuel oil pressure on burner.

No. 417 **Snap Action Water Valve** — Maintains water level in humidifier pans and in tanks.

No. 517 **Water Level Control** — Same as No. 417, but in die cast float chamber with cover.



No. 355 **Large Capacity Float Valve** — Has many uses on tanks, stills, receivers, etc.

No. 61 **Low Water Fuel Cut-Off** — for 1" equalizing pipe installation on low pressure steam boilers.

No. 62 **Low Water Fuel Cut-off** — for water or steam boilers up to 50 lbs. pressure.

No. 65 **Explosion-proof Electric Controller** — Underwriters' approved for hazardous locations.

No. 69 **"Built-in" Low Water Cut-off** — Typical of many "built-ins" for installation in tappings provided in modern boilers.

No. 469 **"Built-in" Low Water Cut-off** — Similar to No. 69, but with less projection into boiler.

No. 767 **Low Water Fuel Cut-off** — (with No. 14 blow-off) for easy installation into opening in boiler.

No. 80 **Switch** — Three wire high- or low-level alarm or pump control on oil storage tanks.

No. 6667 **Conversion Head** — for converting former cut-offs into two-switch types.

No. 154 **High Pressure Pump Control** — Similar to No. 150, but with open contact

WHICH TRENTWELD TUBING FITS YOUR NEEDS?

full finished tubing and pipe sizes

large diameter tubing

ornamental tubing

beverage tubing

Whatever your industrial requirement . . . pressure tubing, stock line tubing, decorative tubing, cooling coils, sanitary beverage tubing . . . the complete TRENTWELD line of quality stainless and high alloy tubing is your best bet! TRENTWELD is made in a *tube* mill by *tube* engineers . . . and is designed for rugged dependability, long life and economical service.

Trent Tube Company *specializes* in the production of stainless and high alloy tubing . . . and that means you get expert advice on applying TRENTWELD to your needs. And you get fast service on delivery because of Trent's convenient mid-continent location. You're assured of finding what you need . . . the complete TRENTWELD line ranges from 1/8" to 30" diameter inclusive.

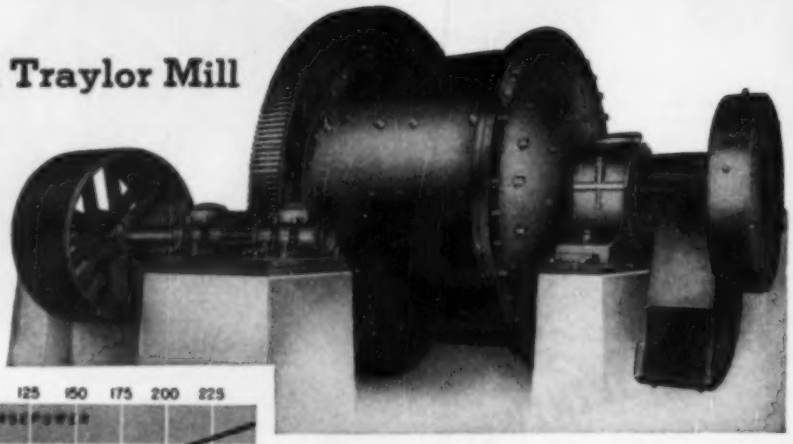
To meet your stainless or high alloy tubing requirements . . . better . . . TRY TRENTWELD! Write for TRENTWELD Data Bulletin.

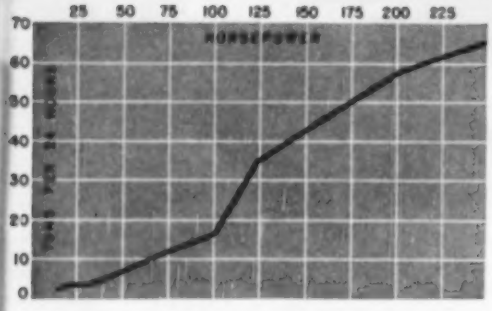
TRENT TUBE COMPANY
Subsidiary of Crucible Steel Company of America
General Offices and Plant: East Troy, Wisconsin
Sales offices in principal cities

TRENTWELD

STAINLESS STEEL TUBING

There's a Traylor Mill for every grinding job . . .



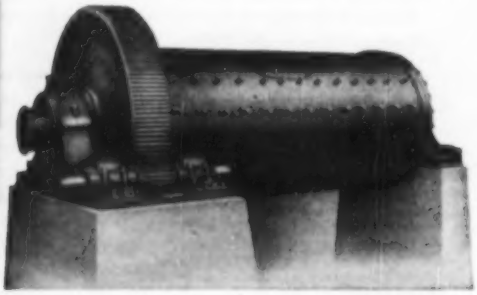


This Chart illustrates the efficiency of Traylor Ball Mills by comparing their high production rate with low power requirements. These figures are based on a typical wet grind in closed circuit of minus 2" Inspiration ore to minus 200 mesh.

Where greatest efficiency demands "tailor-made" grinding . . . Traylor Mills are at work

Increasing costs of many phases of production make it imperative for operators to consider the mechanical efficiency of their plant as a major factor in economical production.

Traylor Ball Mills . . . "tailor-made" for their job . . . are the result of Traylor's 40 years experience in designing and building mills for specific grinding jobs . . . mills that have built their reputation for efficiency on the job.



Traylor Compartment Mills, Rod Mills and Pebble Mills all demonstrate similar high efficiency in their own ranges. Traylor engineers will be glad to recommend the most efficient type and size for your needs.

Traylor Engineers have had broad experience in designing Mills for all types of grinding operations. Write for their helpful advice today.

TRAYLOR ENGINEERING & MANUFACTURING CO.
195 **Mill St., Allentown, Pa.**

Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

Traylor

Rotary Kilns, Coolers and Dryers
Grinding Mills . Crushing Rolls
Jaw, Reduction and Gyratory Crushers

A "TRAYLOR" LEADS TO GREATER PROFITS

Announcing the NEW

JENKINS SWINGTITE

with an exclusive new design that assures smooth action, positive closure, and longer life

In the new Jenkins SWINGTITE Fast-Action Bronze Gate Valve, the exclusive rolling disc and guide track design lengthens valve life and assures maximum tightness as it prevents uneven wear of seating surfaces. As the valve is opened or closed, guide rims around the seating surfaces of discs roll freely over guide tracks cast in the body, distributing wear evenly, dislodging foreign matter, and providing a polishing action for seating surfaces.

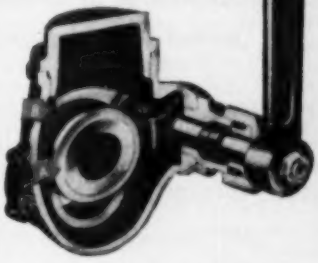
The SWINGTITE can be opened or closed instantaneously and easily with less than a quarter turn of the malleable iron lever which activates the self-adjusting ball and socket type double disc.

Wherever full, free flow is essential . . . where valve opening or closing must be instantaneous . . . you will see more and more Jenkins SWINGTITE Bronze Gate Valves setting new standards of performance and endurance. They are recommended especially for such services as laundry machinery, dish-washing equipment, gasoline and fuel oil lines, fire extinguishing steam lines in kitchens, and dispensing lines to tanks or vats.

Get all the facts on the new Jenkins SWINGTITE. Find out how much smoother-operating, how much *longer-lasting* these fast-action Bronze Gate Valves can be when *Jenkins* builds them. Send for the new folder, Form No. 196, containing full details. Jenkins Bros., 100 Park Avenue, New York 17, N.Y. Jenkins Bros., Ltd., Montreal.

Sold through leading Industrial Distributors

NO OTHER VALVE of its type HAS THIS FEATURE



Notice the guide rims (A) of the discs which rotate freely on the guide tracks (B) cast in the body, as the valve opens or closes. This roller action provides a self-cleaning and polishing effect, and also distributes the wear, since the seating position of the discs changes with each closing. Rapid, uneven wear is prevented, and continuous tight closure assured.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

TRADE JENKINS MARK

Jenkins Bros

CELANESE INTRODUCES

Formcel

TRADEMARK

Formaldehyde in Alcohol

The practicability of handling a relatively water-free alcohol solution of formaldehyde at regular temperatures in standard equipment has been proven by Celanese research and development groups. Cost savings and convenience of handling are among several advantages this Celanese product offers processors of formaldehyde-alcohol end products.

FORMCEL is a solution of formaldehyde in alcohol. Currently this latest Celanese product is available in semi-works quantities in the following alcohols:

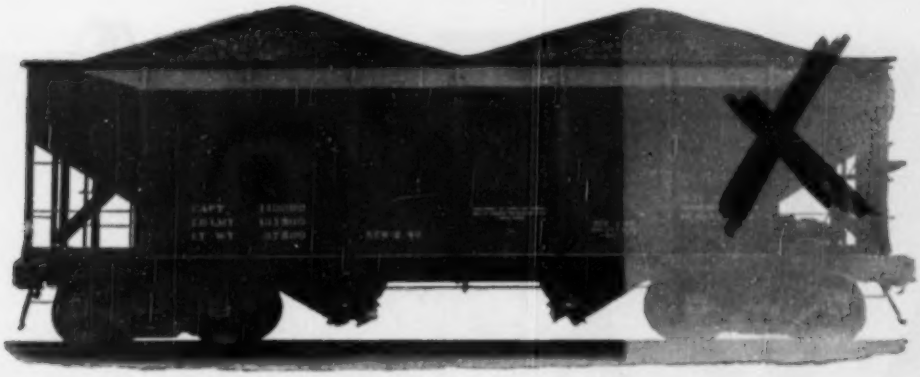
55%	Formaldehyde in	Methanol
40%	"	" "
40%	"	" Propanol
40%	"	" Butanols

Formcel is the direct result of pioneering work in formaldehyde chemistry carried on at the Celanese Petroleum and Research Laboratory at Clarkwood, Texas. We will be glad to send you additional data and other information covering this significant Celanese development. Write: Celanese Corporation of America, Chemical Division, Dept. 53-J, 180 Madison Avenue, New York 16, N. Y.

Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

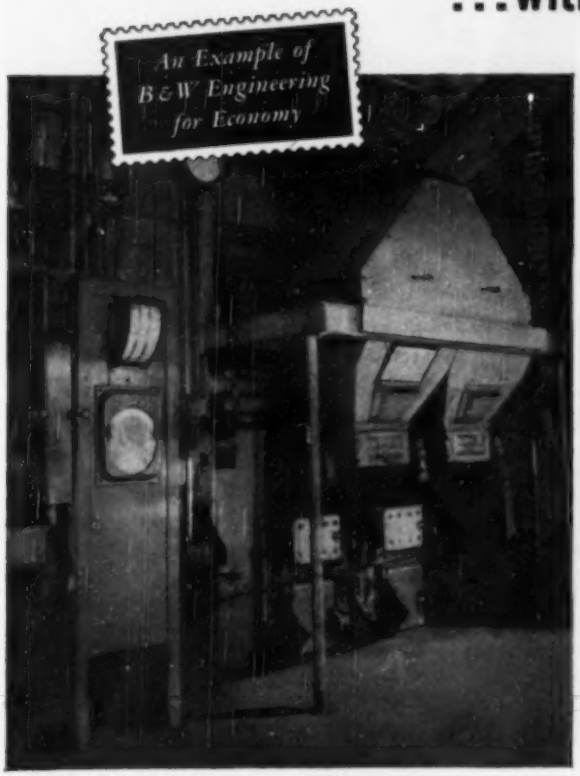
ACIDS • ALCOHOLS • ALDEHYDES • GLYCOLS • KETONES • PLASTICIZERS • SOLVENTS



SPINNER'S PROCESSING COMPANY

Cuts Fuel Costs 25%

...with new B&W Boiler



Stoker-fired unit at Spinner's Processing Company. Capacity: 10,000 lb. per hr. of saturated steam for heating and processing operations.

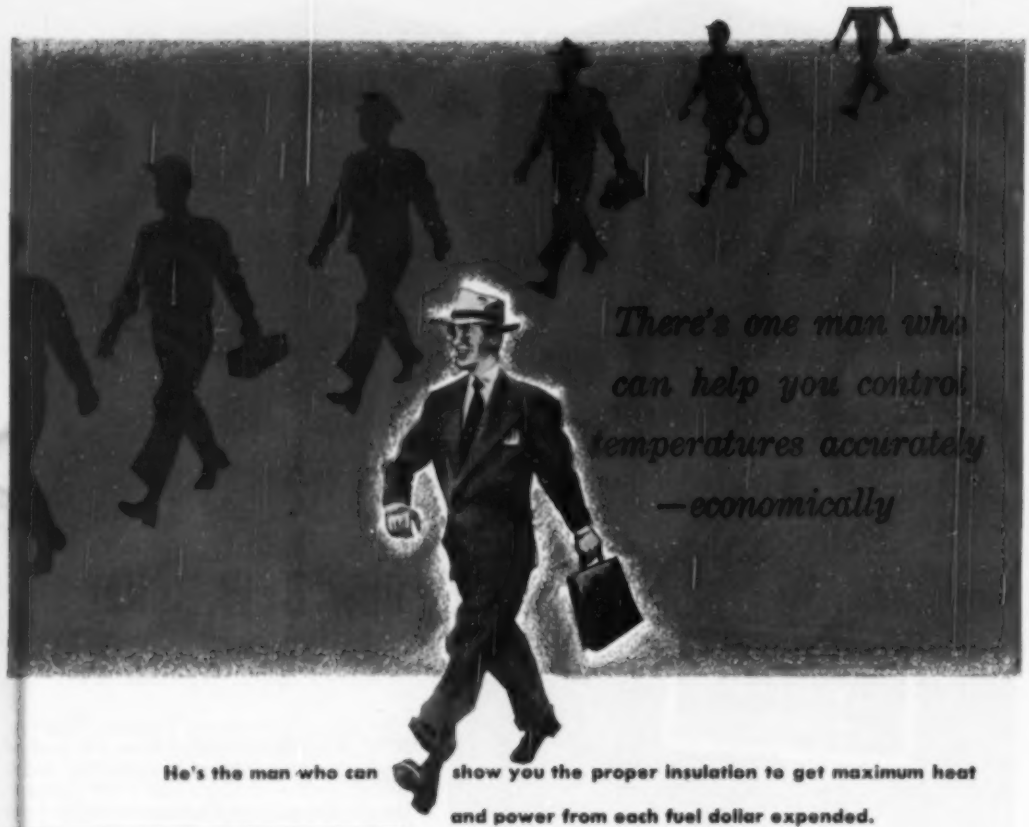
At Spinner's Processing Company, Spindale, N. C., boiler modernization made the kind of good sense that adds up to substantial dollar savings. Since installing a new B&W Integral-Furnace Boiler, Type FF, fuel consumption per lb. of yarn processed has dropped from 1 lb. to ¾ lb. of coal. This neat 25% saving—amounting to almost three tons per day—was achieved despite addition of new dye-house activities.

"We're not selling B&W Boilers," said the Spinner's Processing Company, "but we can't recommend them too highly . . . in three years of continuous operation we have had absolutely no maintenance problems." Thank you, gentlemen. We *are* selling B&W Boilers—lots of them—for the same reasons that make your new unit so satisfactory. Today, over 500 installations are proving the cost-saving advantages of B&W's Integral-Furnace Boilers, Type FF, for steam requirements up to 60,000 lb. per hour under a wide range of operating conditions, fuels, and firing methods.

New Bulletin G-71 details the many advantages of this highly efficient unit. Write: The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

BABCOCK & WILCOX

G-473



He's the man who can show you the proper insulation to get maximum heat and power from each fuel dollar expended.

Here's one insulation that will save you money

EAGLE-PICHER SUPER "66" INSULATING CEMENT

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application . . . give great coverage, retain their thermal efficiency. 100 lbs. covers 65 sq. ft.—1 inch thick! Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800°F. Reclaimable when used on equipment whose temperatures do not exceed 1200°F.!

An Eagle-Picher Industrial Insulation distributor or representative can help you reduce operating expenses because he has available a wide line of insulation products—for high and low temperatures—scientifically designed for maximum thermal efficiency, and practical application. Why not let him give you more information about some of the products listed here?

These Eagle-Picher products can save you money . . . power . . . time

Insulating Felts • Supertemp Blocks • Blankets
Loose Wool • Pipe Covering • Stalastic • Insulseal • Insulstic
Swetchek • Finishing Cements • Insulating Cements
Fireproofing Cement • Diatomaceous Earth Blocks

THE EAGLE-PICHER COMPANY

General Offices: Cincinnati (1), Ohio

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

EAGLE EP PICHER

Since 1843

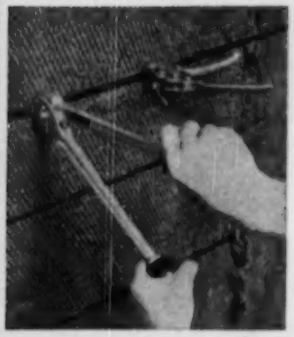
2155 • 2950

Get maximum fuel savings and exact temperature control with these versatile, efficient insulations

For a completely effective, low-cost insulation combination, you can't beat the teamwork of Eagle-Picher Mineral Wool Blankets, Supertemp Blocks, Super "66" Insulating Cement, No. 106 Fireproofing Cement and Insulseal. They work effectively to give your equipment highest possible thermal efficiency . . . cut operating costs by saving maximum amount of fuel . . . and help to provide perfect, precise control over temperatures.

EAGLE-PICHER FIREPROOFING CEMENT

Mixed with water to form a stiff plastic mix for easy application on ribbed lath. Recommended for fireproofing structural steel columns, steel tank supports, skirts and equipment bases. Has high dry coverage of approximately 30 sq. ft. 1 inch thick per 100 pounds. Adds fire protection, patented rust-inhibitor resists corrosion. Tested by Underwriters' Laboratories, Inc.



EAGLE-PICHER MINERAL WOOL BLANKETS

These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enables Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.

EAGLE-PICHER SUPERTEMP BLOCKS

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit odd-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700° F. Conductivity at 512° F. approximately 0.43 . . . all standard sizes, from 3" x 18" to 12" x 36" . . . in thicknesses from 1" to 4".

EAGLE-PICHER INSULSEAL

A tough, weatherproof, protective coating for insulation. For temperatures up to 450° F. Applied as a plastic, its smooth troweling qualities assure uniform coverage, proper thickness. It protects insulation from air infiltration, fumes, rain, snow, vibration, punctures, and withstands severe service, indoors or out. Dries to a smooth, rich black, has a neat appearance on hot or cold surfaces . . . may be washed or painted.

THE EAGLE-PICHER COMPANY General Offices: Cincinnati (1), Ohio

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

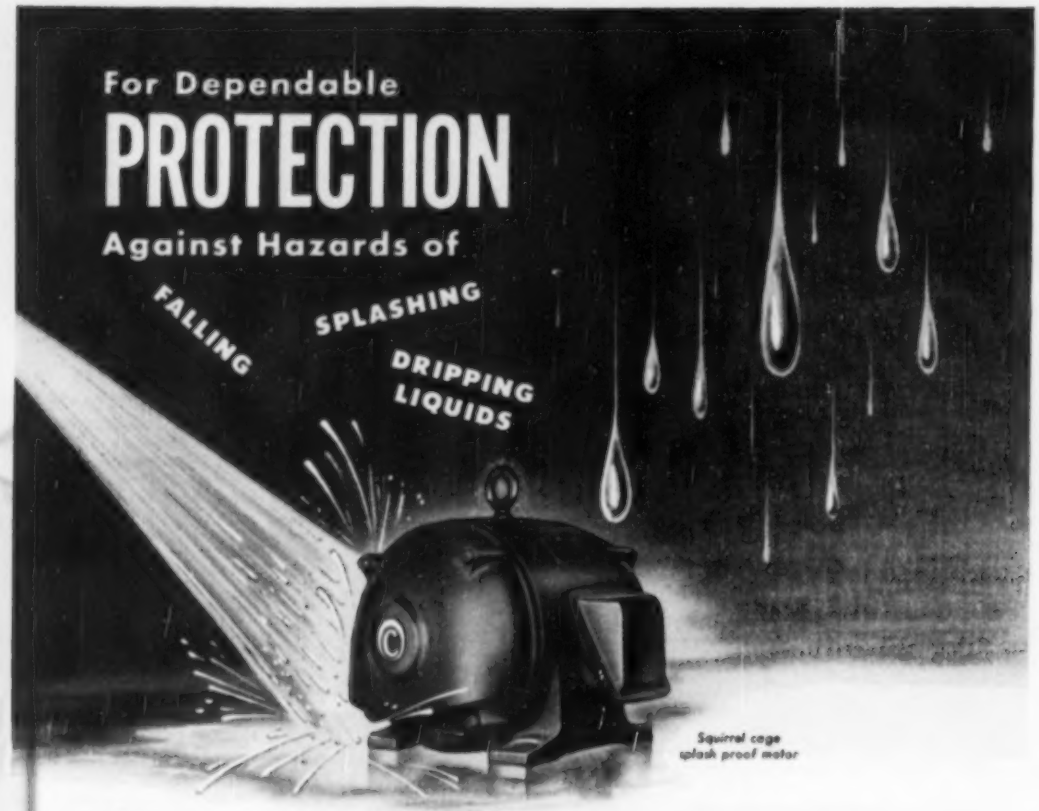
EAGLE EP PICHER *Since 1843*

For Dependable

PROTECTION

Against Hazards of

FALLING SPLASHING DRIPPING LIQUIDS



Squirrel cage splash proof motor

Direct current splash proof motor

Wound rotor splash proof polyphase motor

Repulsion start induction brush lifting single phase splash proof motor.

Use Century Splash Proof Motors

Whether installed indoors or outdoors, Century Splash Proof motors eliminate production losses caused by liquids entering the vital parts of the motor. The unique design of the Century Splash Proof frame prohibits water from entering, even when applied with the full force of a hose during a plant wash-down.

For many years Century Splash Proof motors have proved their dependability in chemical processing plants, dye houses, food and dairy plants—on outdoor cooling towers, oil well pumping units, as well as many others.

Wherever splashing liquids create a hazard, specify the correct Century motor housed in a splash proof frame.

For popular applications throughout industry, Century builds electric motors in a wide range of types and kinds—in sizes from 1/6 to 400 horsepower.

Specify Century motors for all your electric power requirements.

CENTURY ELECTRIC CO. 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

Century C MOTORS

671

ALTERNATING CURRENT MOTORS

POLYPHASE

Squirrel Cage Induction—1/6 to 400 H.P.
Wound Rotor Motors—1 to 400 H.P.
Synchronous Motors—20 to 150 H.P.

SINGLE PHASE

Split Phase Induction—1/6, 1/4, 1/3 H.P.
Capacitor—1/6 to 20 H.P.
Repulsion Start, Brush Lifting, Induction—1/2 to 20 H.P.

DIRECT CURRENT MOTORS

1/6 to 300 H.P.

GENERATORS

AC, .63 to 250 KVA
DC, .75 to 200 KW

GEAR MOTORS

1/8 to 1-1/2 H.P.

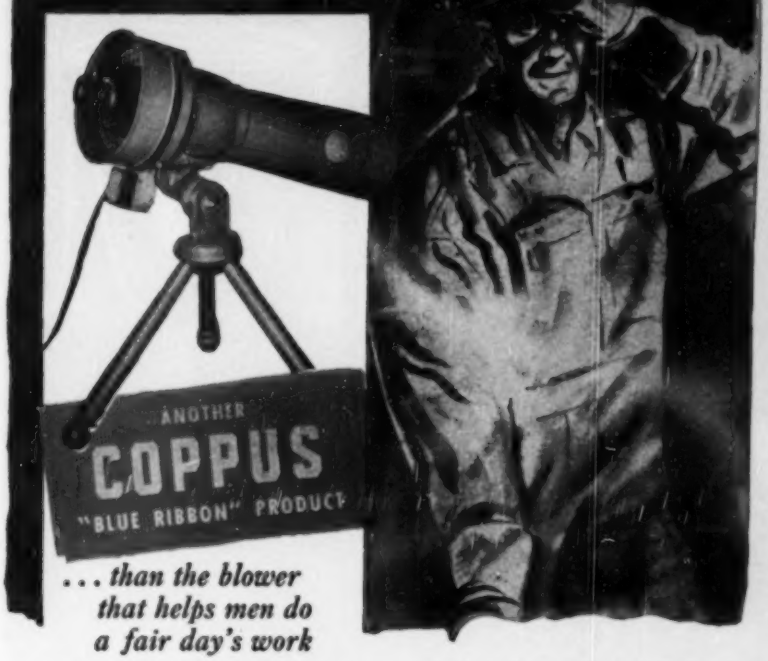
MOTOR GENERATOR SETS

AC to DC, AC to AC
DC to DC, DC to AC

Open Protected, Splash Proof, Totally Enclosed Fan Cooled, Explosion Proof.

Ball Bearing motors are factory lubricated for several years' normal service. Bearing housing construction permits easy relubrication when unusual service demands it.

Down time due to FOUL AIR adds more to your costs...



... than the blower that helps men do a fair day's work

Speed fresh, cool air into a furnace, manhole, tank or other confined area where men must work and you'll get faster, better work in return.

There's a portable, easily adaptable Coppus Blower or Exhauster for just about any problem caused by stagnant, hot or fume-filled air. The Blue Ribbon stands for precision engineering that assures peak performance at lowest cost. Check and mail the coupon today for the information that fits your particular problem. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER
COPPUS
"BLUE RIBBON"
PRODUCTS

HORIZONTAL TURBINE
Six frame sizes —
1 to 150 horsepower.

VERTICAL TURBINE
Six frame sizes —
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp., 230 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

BAKER PLATINUM LABORATORY WARE

...exacting tests could be applied to any ... than those to which our platinum lab... ware is subjected. The tests are contin... because we maintain and operate large scientific ... and naturally employ our own laboratory ware in them.

The consequence is that any divergence from our high standards, any defect in manufacture, would show up inevitably.

All this makes it doubly safe for you to adopt Baker Laboratory Ware as standard equipment. You can't possibly go wrong in choosing it.

BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK 7 CHICAGO 2

SAN FRANCISCO 2

Remarkable New Oils for small precision bearings and gears

Two more new Gulf products to help you gain an edge in the battle of costs! Gulf Micro Bearing Oil and Gulf Special Instrument Oil provide longlasting, gum-free lubrication for small precision bearings and gears.

These remarkable new oils are nonspreading, which means that when properly applied they don't creep out of small pivots, ball bearings or away from gears and cams even after extended periods of service—thus the relubrication interval can be greatly increased.

Both oils are nongumming—have high resistance to oxidation and exceptionally low volatility. These characteristics insure freedom from deposits and low frictional resistance in every application.

Gulf Micro Bearing Oil and Gulf Special Instrument Oil are the answer to problems like these in many types of instruments and precision mechanisms: excessive spreading of lubricant; rusting or gumming of highly finished surfaces; where lubrication must be for the life of the mechanism or frequency of application must be reduced; and lubrication of inaccessible parts.

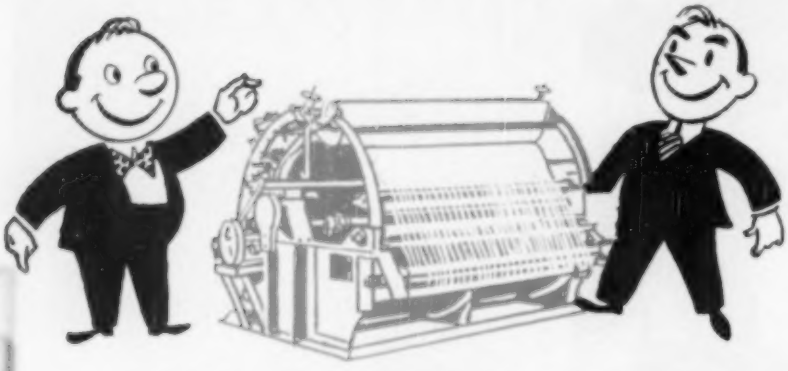
Perhaps one of these outstanding new oils can be used profitably in your plant or product. Write, wire, or phone your nearest Gulf office today and ask a Gulf Lubrication Engineer to call.

GULF OIL CORPORATION · GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH, PA.
Sales Offices - Warehouses
Located in principal cities and towns throughout Gulf's marketing territory

GULF INDUSTRIAL LUBRICATION

Helps make machines produce more at lower cost

TIPS ON SOLVING DRYING PROBLEMS – **NO. 3**



WHAT SHOULD YOU DO ABOUT WET PROCESSING EQUIPMENT?

To assure the speediest, least costly solution to a drying problem, nothing should be done about wet processing equipment until you have discussed your *tentative* ideas on this equipment with Proctor engineers. It should be considered in the light of how it fits in with drying as another link in the over-all process.

Your original ideas on the manner in which your product will be handled prior to delivery to the dryer are studied by Proctor engineers to determine how well the product is suited to existing basic dryer designs. A simple change in preliminary processing may result in considerable saving by making it possible to employ a basic design without the necessity of engineering from "the ground up."

Proctor engineers are thoroughly acquainted with existing wet processing equipment and have in the past frequently worked closely with the technicians of wet processing machinery manufacturers in an effort to serve a mutual customer's best interests.

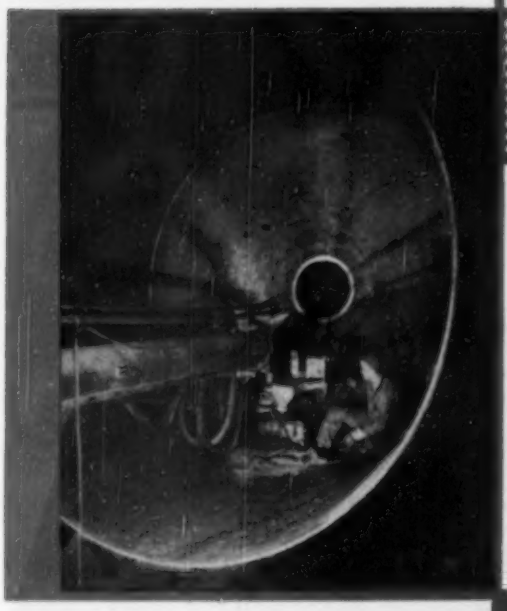
For the complete story of the Proctor approach to solving drying problems, write for Bulletin 361. For a lucid explanation of Proctor Drying Systems for the Process Industries, ask for Bulletin 342 as well.

A FEW TYPICAL MATERIALS BEING DRIED IN PROCTOR CONTINUOUS CONVEYOR SYSTEMS

Starch
Titanium Dioxide
Sulfa Drugs
Calcium carbonate
Magnesium carbonate
Clay
White Lead
Finished Lithopone
Soy Bean Protein
Lead arsenate
Nitro guanadine

PROCTOR CONTINUOUS CONVEYOR SYSTEMS

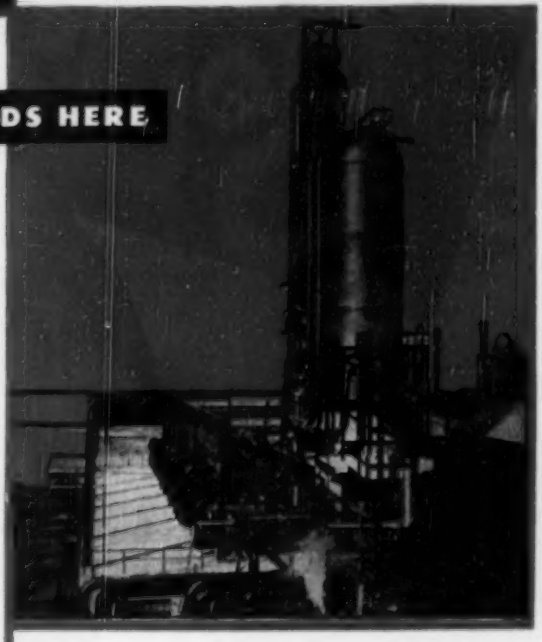
PROCTOR & SCHWARTZ INC • 711 TABOR ROAD • PHILADELPHIA 20 • PA •



Another Example of B&W Research, Engineering, & Facilities

THIS Plus Value IN B&W PROCESS EQUIPMENT

PAYS DIVIDENDS HERE



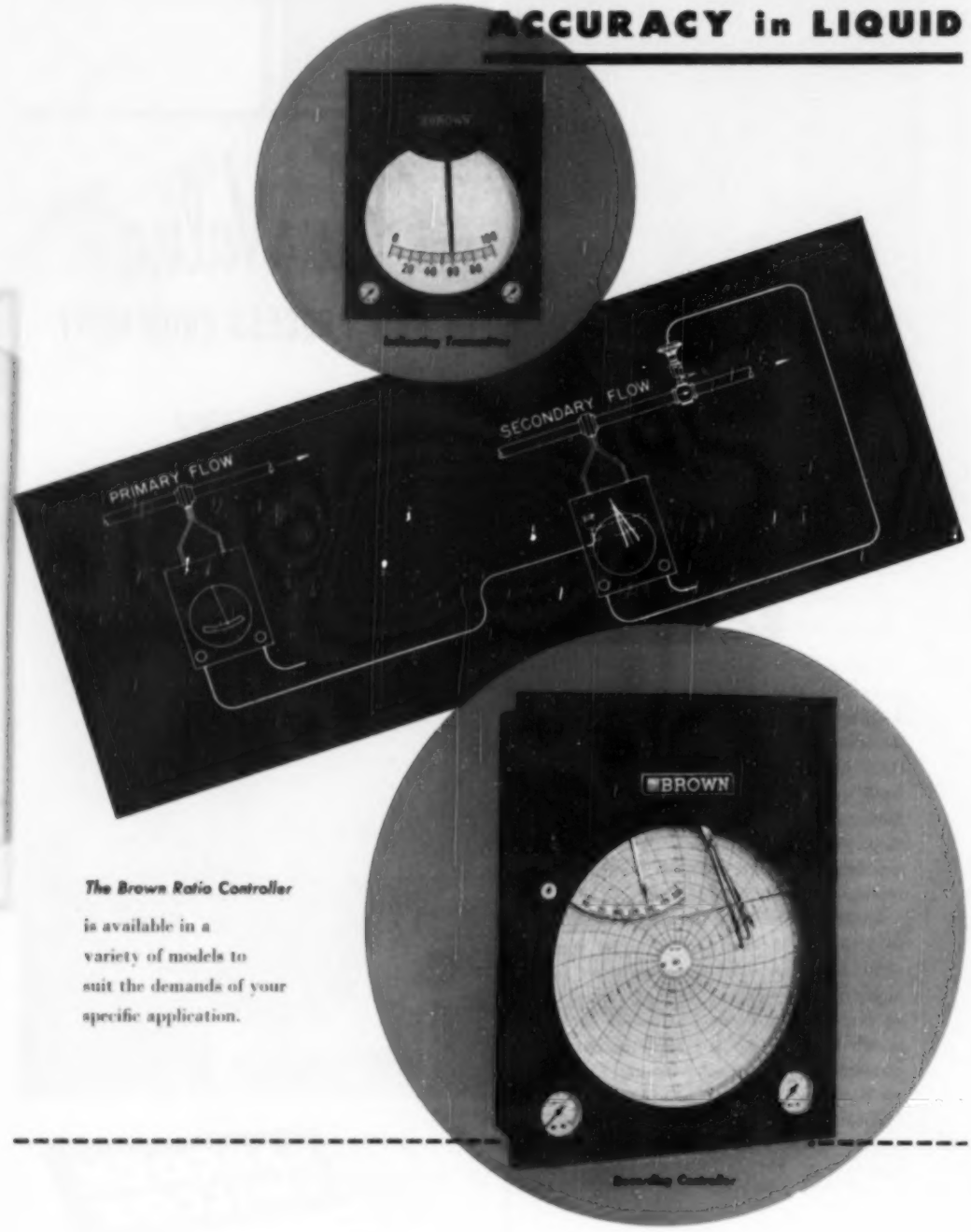
ILLUSTRATED above is a typical example of the advanced welding practices employed at B&W for the fabrication of pressure vessels. B&W's history of resourceful engineering is distinguished by a 25-year-old succession of developments and improvements in welding machines, automatic controls, techniques, coating of electrodes, inspections, and tests.

B&W's leadership in welding—beginning in 1930 with the first welded boiler drum approved by an engineering authority for high-pressure operation—is being applied to an ever-broadening range of quality-welded vessels for high and low temperatures and pressures, and for corrosive services. Chances are B&W has the economical solution to your process equipment problems. The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

BABCOCK & WILCOX

6-401

When you're looking for **SIMPLICITY** and **ACCURACY** in **LIQUID**



The Brown Ratio Controller is available in a variety of models to suit the demands of your specific application.

PROPORTIONING . . .

The Brown Ratio Control System affords a simple, accurate and highly dependable means of maintaining a secondary flow or liquid level at a fixed ratio to a primary flow or level.

The controller is so flexible that the ratio may be adjusted so that the secondary pen movement is anywhere from 25% to 200% (linear measurement) or 50% to 141% (square root measurement) of the primary pen movement.

Call the Honeywell engineer for a discussion of your ratio control problems . . . he is as near as your phone!

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Phila. 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

Check These Operating Features:

- *Desired ratio is easily set on a long scale plainly visible through the glass of the door.*
- *Ratio adjustment is fine; almost ten turns of the setting knob are required for a full range movement of ratio pointer.*
- *Both variables recorded on one chart.*
- *Use of pneumatic transmission permits centralized control from panel.*
- *Use of matched bellows in transmitter and receiver eliminates any errors due to variations in characteristic of an individual spring and bellows unit.*

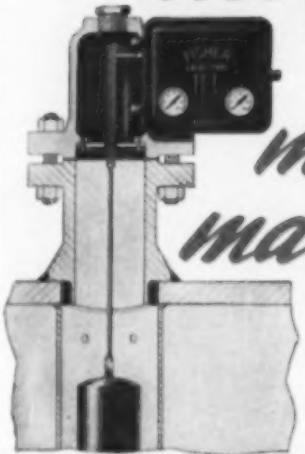
MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

TYPE 2405-249
EXTERNAL MOUNTING
LEVEL-TROL

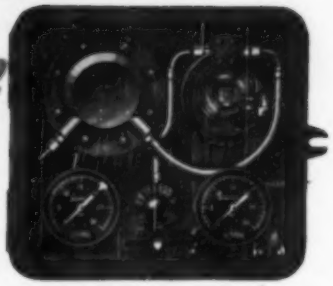
6 years of proven field acceptance with minimum maintenance

FISHER LEVEL-TROL



FRONT VIEW SECTIONAL OF TYPE 2405-249P TOP MOUNTING LEVEL-TROL

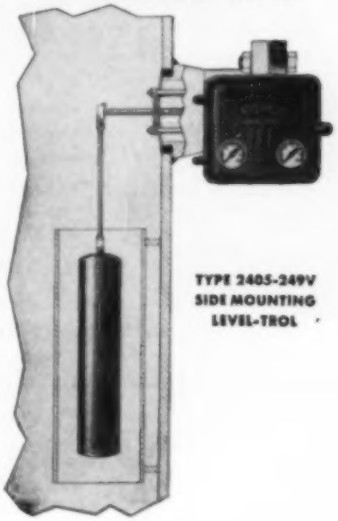
Fisher Level-Trol is designed for accurate and precise control of all liquids at all specific gravities and temperatures. Available in internal or external mounting constructions for indicating or controlling liquid level.



TYPE 2405 LEVEL-TROL PILOT

Features

- Pilot is entirely pneumatic in operation. No intervening links or mechanical joints.
- One control knob with calibrated scale for proportional band and specific gravity adjustment.
- Torque tube can be exchanged or replaced without dismantling entire level controller or breaking into pressure piping.
- High-tensile iron, pressure-tight weatherproof case with hinged gasket sealed cover.
- 8 flanged and screwed mounting connection combinations with 8 standard cage lengths from 14" to 120".



TYPE 2405-249V
SIDE MOUNTING
LEVEL-TROL

WRITE TODAY FOR BULLETIN F2

FISHER GOVERNOR CO.
MARSHALLTOWN, IOWA

For easier, better welding . . .

GRINNELL WELDING FITTINGS

A qualified welder can make welds quickly and easily with Grinnell Welding Fittings. These fittings are made by a hydraulic forging process that assures uniform wall thickness at all points and true circularity throughout. Of seamless, one-piece construction, they can be cut at any angle to match up with standard weight, and extra strong and heavier wall pipe in I.D. or O.D. sizes. Pressure-temperature ratings are equal to or greater than those of seamless steel pipe. Grinnell Welding Fittings are process stress-relieved.

Permanent Identification

Each Welding Fitting bears a metal plate giving size, wall thickness, material and name for easy, positive identification.

Full Length Outlets

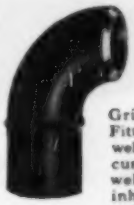
Full length outlets permit fast lining up and ample room for rod manipulation; keep high welding heat away from vital crotch zones.

Uniform Wall Thickness

Uniform wall thickness at all points permits perfect lineup with pipe, O.D. and I.D. No thinning of long outer wall . . . no thickening of short inner wall. Complies with code requirements.

True Circular Section

True circular section at all points makes fitting easy to align and weld . . . no distortion or flattening to affect flow adversely.

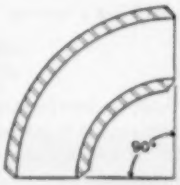


Plain Circumferential Butt Welds

Grinnell Welding Fittings confine all welds to plain circumferential butt welds—with their inherent strength and simplicity.

Accurate Bevels

Accurate bevels aid aligning and welding. Standard straight bevel for thickness (T) 3/16 to 3/4 inch inclusive. Standard U-bevel for thickness (T) greater than 3/4 inch.



True Included Angles

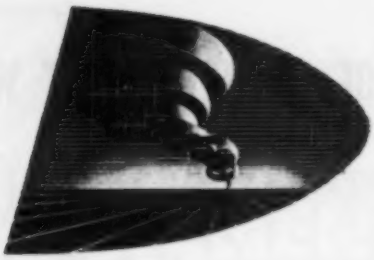
True included angles permit fabrication and erection of complicated piping systems to exact measurements.

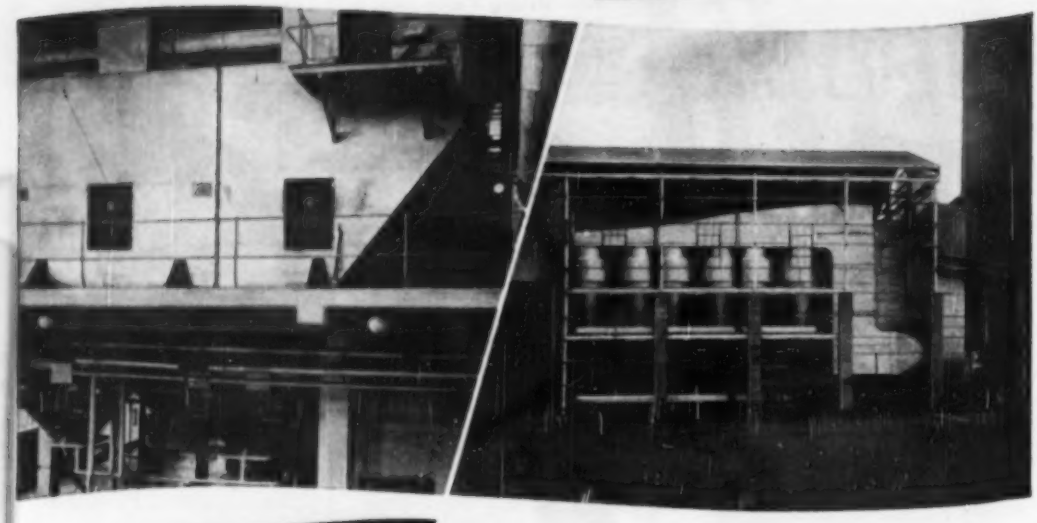
Send for copy of this new catalog showing the complete line of Grinnell Welding Fittings and Forged Steel Flanges.

GRINNELL

Grinnell Company, Inc., Providence, R. I. Branches: Atlanta • Billings • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Pocatello • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

fines
fumes
and 'ficiencies





IN DUST RECOVERY

The advent of the Buell 'SF' Electric Precipitator, as a running mate with Buell's far-famed van Tongeren Cyclones, is significant. It moves Buell into a forefront position for consultation on dust collection...

whatever the nature or fineness of the material to be recovered.

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Engineered Efficiency in **Dust Collection**

No. 5 / Quick Quiz on Copper Piping

Q **What evidence is there of copper tube's satisfactory performance in heating systems?**

A The substantial, growing trend to use copper tube in all types of heating systems, notably forced-circulation hot water and radiant panel heating.

Q **What are some of copper tubing's advantages?**

A Durability, flexibility, light weight, labor savings and low total cost.

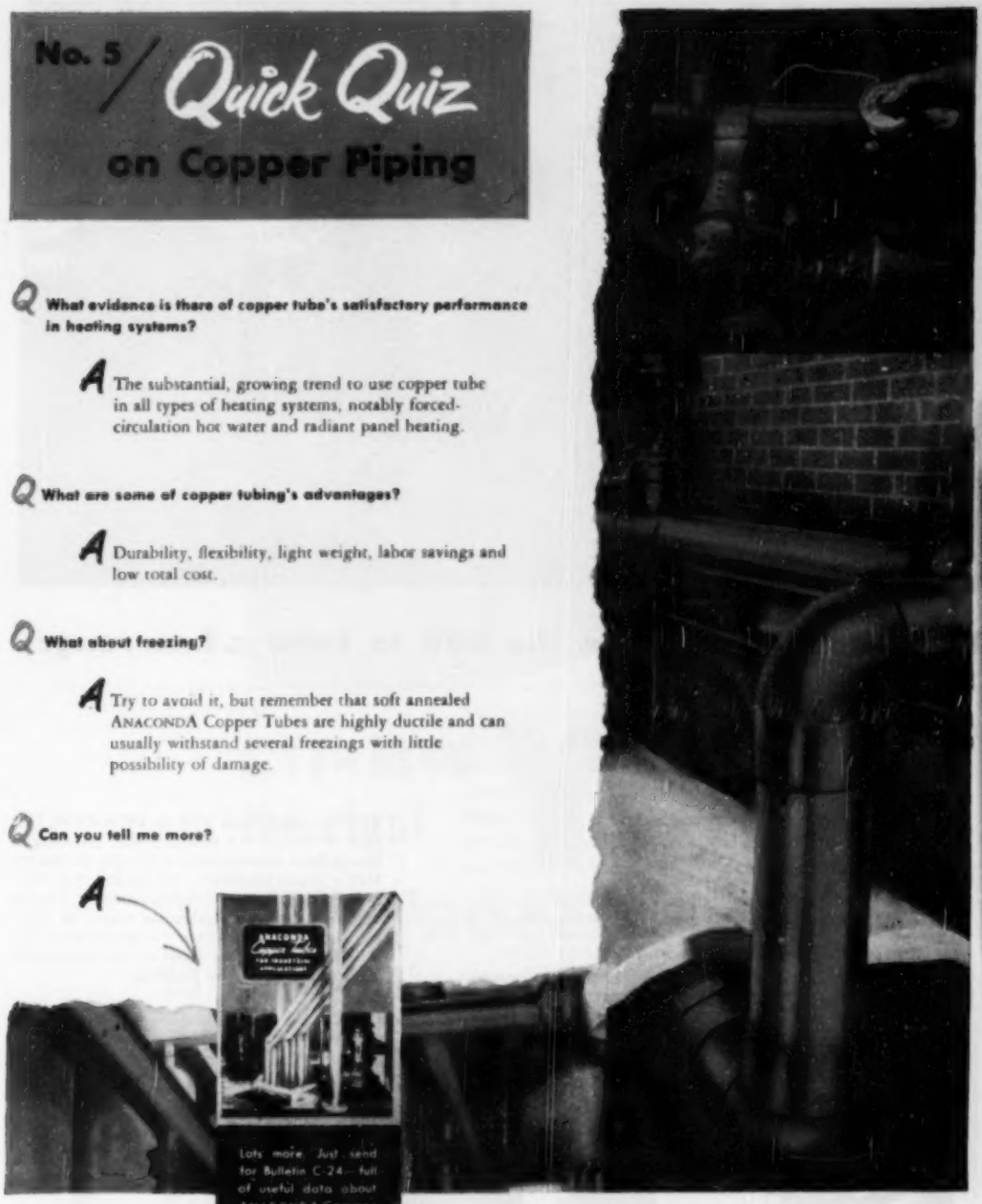
Q **What about freezing?**

A Try to avoid it, but remember that soft annealed ANACONDA Copper Tubes are highly ductile and can usually withstand several freezings with little possibility of damage.

Q **Can you tell me more?**

A

Lots more. Just send for Bulletin C-24—full of useful data about ANACONDA Copper Tubes and their many industrial applications. Just write The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.



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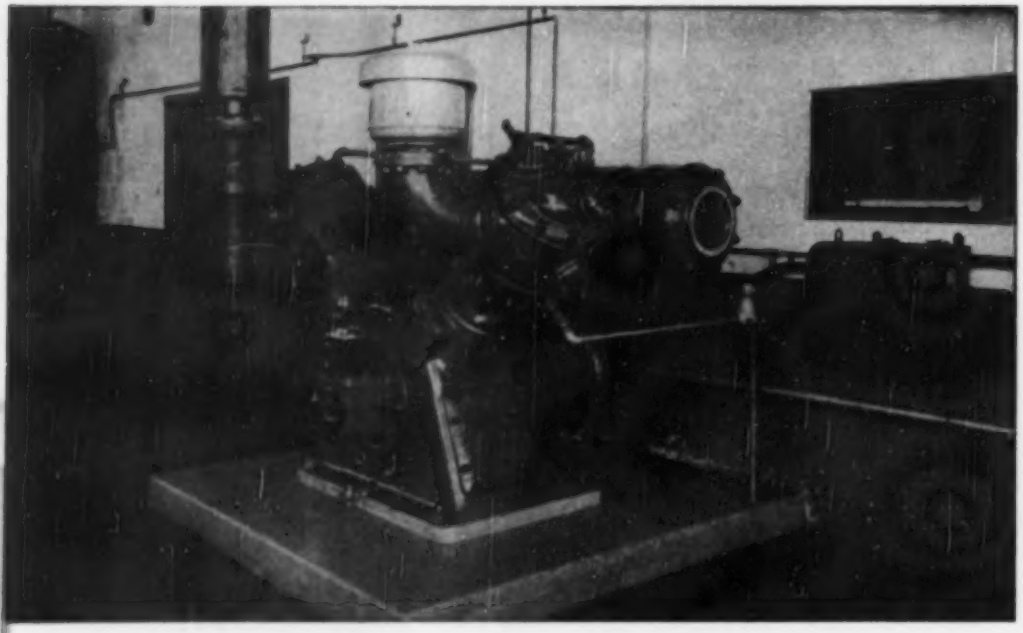

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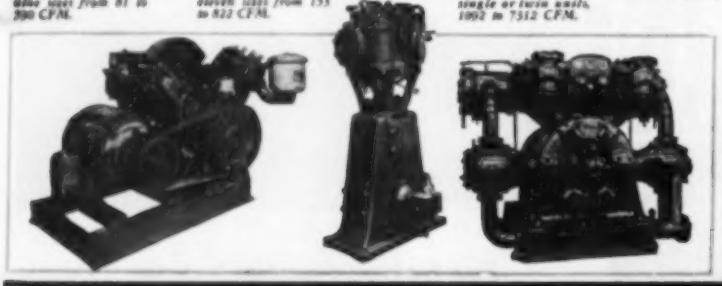
The JOY WG 9, in eleven sizes from 155 to 822 CFM.

The JOY WN 114, in single or twin units, 1092 to 7312 CFM.



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LEATHER Hydroxyacetic Acid • "Hypalon" Synthetic Resins • "Lorol" Fatty Alcohols

MACHINERY "National" Anhydrous Ammonia • "Opalwax" Synthetic Wax

METALS Hydroxyacetic Acid • Methanol • "National" Anhydrous Ammonia

PAPER Adipic Acid • "Alathon" Polythene Resins • "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • Hydroxyacetic Acid • "Lorol" Fatty Alcohols • "Mycoban" Sodium and Calcium Propionate • "National" Anhydrous Ammonia • "National" Aqua Ammonia • Nylon-Type 8

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**This is only a partial listing of the Polychemicals Department products which have applications in the industries shown here.*

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Department

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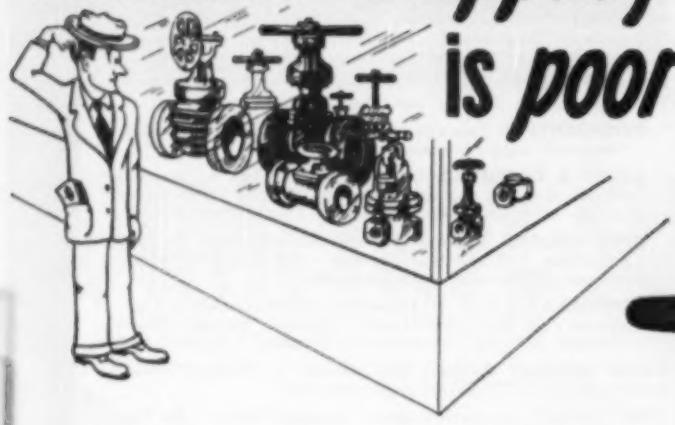
"Window Shopping" for Valves is poor economy



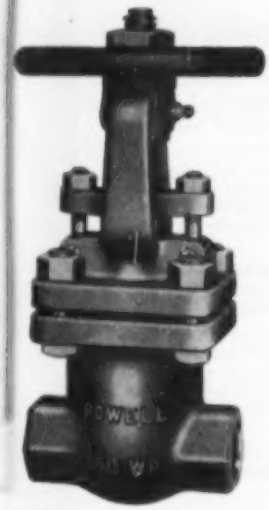


Fig. 2490 (18-8S, 18-8S Mo, Durimet "20") and Fig. 2492 (Monel Metal, Nickel, Ampco, Everdur, Hastelloy Alloys A-B-C-D). 150-pound O. S. & Y. Gate Valve with screwed ends and solid wedge. Also available with double wedges. Flanged end valves have face-to-face dimensions conforming to MSS SP-42.

Fig. 375 — 200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable wear-resisting "Powellium" nickel-bronze disc.

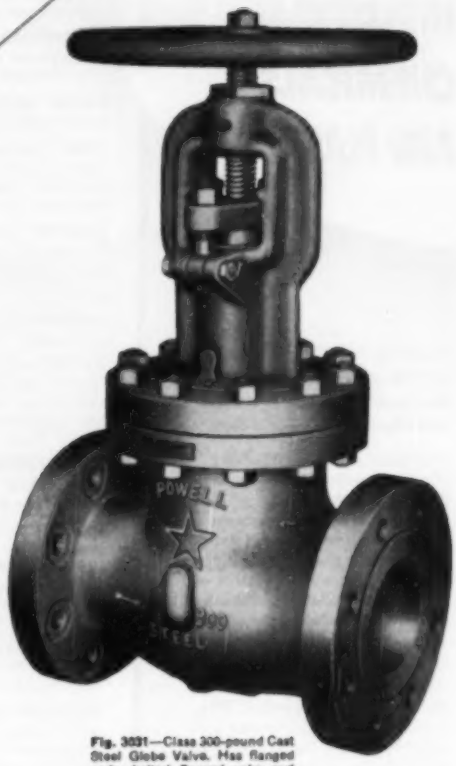


Fig. 3031—Class 300-pound Cast Steel Globe Valve. Has flanged ends, bolted flanged yoke and outside screw rising stem.

POWELL

Reading advertisements is like "window shopping"—it's a good way to see what's on the market. But don't let it influence you into buying your flow control equipment from different sources.

Because if you buy all your valves from one source you avoid these pitfalls:

Complications in stocking spare valve parts.

Difficulties that confront the maintenance department in making repairs on a variety of valves.

The necessity of carrying a much larger stock of repair parts.

The chances of installing valves that are not backed by adequate engineering service.

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Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Made in sizes 2" to 30", incl. Has flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

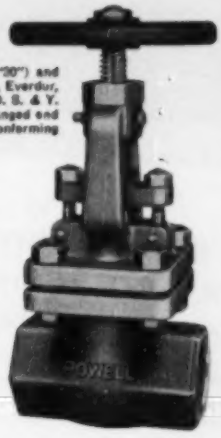

Fig. 2474 (18-8S, 18-8S Mo, Durimet "20") and Fig. 2478 (Monel Metal, Nickel, Ampco, Everdur, Hastelloy Alloys A-B-C-D). 150-pound O. S. & Y. Globe Valve with screwed ends. Also flanged end valves, with face-to-face dimension conforming to MSS SP-42, are available.

Fig. 580—200-pound Bronze Regrinding Horizontal Swing Check Valve. Screwed ends, screwed-on cap and regrindable, renewable bronze disc.

The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

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They have learned from experience that Tygon Paints give up to three or four times the maintenance-free life of other type coatings . . . that Tygon Paints provide real protection against even the most corrosive conditions.

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COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

In Washington, a powwow on chemicals

Eighteen top executives of the nation's chemical industry got together with officials of the Commerce Department's new National Production Authority in Washington on September 22. Purpose of the meeting: to set up an industry advisory committee on chemicals and to exchange ideas.

NPA officials got industry's reaction to their tentative schemes for controls that might have to be clamped on in a crisis. Ideas on how the Defense Production Act of 1950 should be administered were thrashed out. Industry executives limned in the supply and demand picture in chemicals. They were asked about plans for expanding production of short items. In particular, the benzene famine and the shortage of tank cars were discussed.

The controls agency responsible for chemicals is the Chemicals Division in the Department of Commerce. It has been yanked out of the Office of Industry & Commerce and placed under William H. Harrison's NPA. But there seems scant likelihood of basic chemicals being allocated at this stage of the game. However, six critical chemicals—ethyl alcohol, benzene, glycerine, caustic soda, chlorine and soda ash—have already been put under inventory control.

Acrylonitrile from acetylene

DIRECT PROCESS—Production of acrylonitrile and related chemicals from acetylene by a direct process is the new program that Monsanto is embarking upon. For this purpose, Monsanto will spend about $30 million within the next few years to expand its Texas City operations.

NEW FACILITIES—Construction of new facilities is getting started at the present styrene manufacturing location at the company's Texas City plant. Upon completion these facilities will nearly double the size of the present plant, which was rebuilt after almost total destruction following the explosion of the French freighter Grandcamp in April 1947. This expansion program will more than double Monsanto's investment at Texas City.

RESEARCH—Intensive exploratory research and development work at Monsanto's Central Research Laboratories in Dayton, Ohio, laid the groundwork for the production of acrylonitrile and other chemicals directly from acetylene. Dr. Nicholas N. T. Samaras, director of the laboratories, states that years of research preceded the major program of pilot-plant and engineering work at Dayton that was required for the production of acrylonitrile. Central Research Laboratories activities on this project started in May 1942. Since that time, the program has been directed by Roy W. Sudhoff, assistant laboratory director.

SIGNIFICANCE—While it has not heretofore been produced by the company, acrylonitrile, long under study, has become increasingly important in Monsanto's expanding operations. Acrylonitrile, of course, is an important ingredient in synthetic fibers, plastics and Buna-N rubber, all of which are closely related to war production.

Synthetic fiber output soars

RECORDS—Synthetic-fiber production and sales should reach new highs in 1950. Present strengthening of American defenses around the world has given the green light to expansion plans of producers. With the stimulus of $10 billion in orders being added to the over-all economy for the fiscal year ending next June, synthetic-yarn producers should have no difficulty in overtaking or surpassing top production figures of 1948.

STATISTICS—Production and shipments of all types of synthetic fibers soared to record heights during March of this year, and were generally on a higher plateau for the first six months than during the same period last year. The over-all rayon filament and staple pattern was different from last year's spring and early summer doldrums and curtailed production. Shipments ran 46 percent higher this year.

A record-breaking 641 million linear yards of all synthetic fibers was woven during the first quarter of 1950, of which 593 million yards was rayon.

ACTIVITY—More different synthetic fibers are under development now than have ever been in the history of textiles. Every important chemical producer is investigating fiber-forming materials. Each is considering producing textile fiber or supplying others with the chemicals needed. Witness Du Pont,

(Continued on page 68)

Carbide, Monsanto, American Viscose, and American Cyanamid.

Of the thousands of fiber-forming materials, over 99 percent fail to make the grade because of poor properties or excessive production costs.

Any fiber that can be spun on existing spinning equipment has a better chance of being produced than one for which an entirely new line of equipment must be built and housed. Some new fibers that can be spun on existing equipment: Fiber V on nylon-spinning machines; Vinyon N on acetate-spinning equipment; and chemically crimped rayon staple on viscose-spinning equipment.

Lack of chemicals in large quantities at low costs frequently prevents a fiber from being seriously considered. You've got to start with a chemical in good supply or one that can be produced in tonnage quantities relatively inexpensively.

Wool is under attack today much as silk was a quarter century ago. Acrylic fibers are the greatest threat to wool.

Restrictions on tung oil from China?

The State Department has announced that the United States proposes to end certain tariff concessions granted to Nationalist China. Commenting on this action, W. W. Kilby, secretary-manager of the American Tung Oil Association, states that the tung industry is now hopeful of obtaining restrictions on the import of tung oil into the U. S.

The southern tung industry contends that the domestic industry cannot expand and become completely stabilized while it competes with cheap Chinese tung oil produced with coolie labor and imported into this country without restrictions.

In 1940 the U. S. tung industry produced 3.5 million pounds of oil, and last year 25 million pounds. With import restrictions, the people of the tung belt would be encouraged to develop the industry to the point where it could produce all the oil needed for domestic consumption and eliminate dependence on Red-controlled China, according to Kilby.

Butadiene: the logistics get confusing

Butadiene, with its highly reactive pair of double bonds, holds promise as an important raw material for production of synthetic organics.

Du Pont, for example, is to use a radical new process at its Victoria, Tex., plant to get nylon salt from butadiene. Companies like Archer-Daniels-Midland and Standard Oil Development Co. have modified drying oils with butadiene. Standard Oil Development has produced a solid resin from it, and has even been at work on a butadiene product that is a complete varnish in itself.

Right now, however, many ambitious plans for this chemical may have to be shelved. For butadiene from all sources is needed for the huge synthetic rubber program. So much so, in fact, that the Office of Rubber Reserve in September ordered back into operation the Kobuta and Louisville plants for the high-cost production of butadiene from alcohol.

Whatever the government's bookkeeping system, cost of butadiene made at Kobuta and Louisville is going to be high. Say it comes to 40 c. a lb. That compares with about 10 c. a lb. that petroleum refiners get for the butadiene they make. This difference would jack up the average cost to RFC of synthetic rubber made from this butadiene by perhaps 5 c. per lb. New costs for butadiene, styrene, labor, steam and power would require pricing synthetic between 22.5 and 24 c. per lb. for sale if Rubber Reserve is to continue paying interest and capital retirement to the U. S. Treasury. Whether the government will increase the price of synthetic rubber to users from the 18.5 c. by 5 to 7 c. is a big question. Even if it did, the synthetic would still be cheaper than natural rubber, which has been over 60 c. a lb.

Actual new cost to the taxpayer would be much lower if the alcohol for this butadiene production were all made from surplus potatoes and surplus grain. Much of it may be. But unquestionably distillers will be asked to submit offerings of alcohol. Eventually, alcohol may even get so tight that allocations will be called for.

If all-out production, from both petroleum and alcohol, provides enough butadiene, the pinch on styrene users won't be so painful. More butadiene and less styrene can be put into GR-S copolymer. On the other hand, users of unsaturated petroleum hydrocarbons are going to find it harder to get these raw materials. More of these unsaturated hydrocarbons will be gobbled up at refineries to produce badly wanted butadiene.

Minimum wages under Walsh-Healey Act

The chemical industry is being split into three groups by the Wage-Hour & Public Contracts Division of the Labor Department. This is for the purpose of determining minimum wages that must be paid for work on government contracts of more than $10,000. Up till now, there has been only one classification: the catch-all "chemicals and related products." And the rate, previously 50 c. an hr. (40 c. in the South), has been 75 c. since the new minimum wage law went into effect in January.

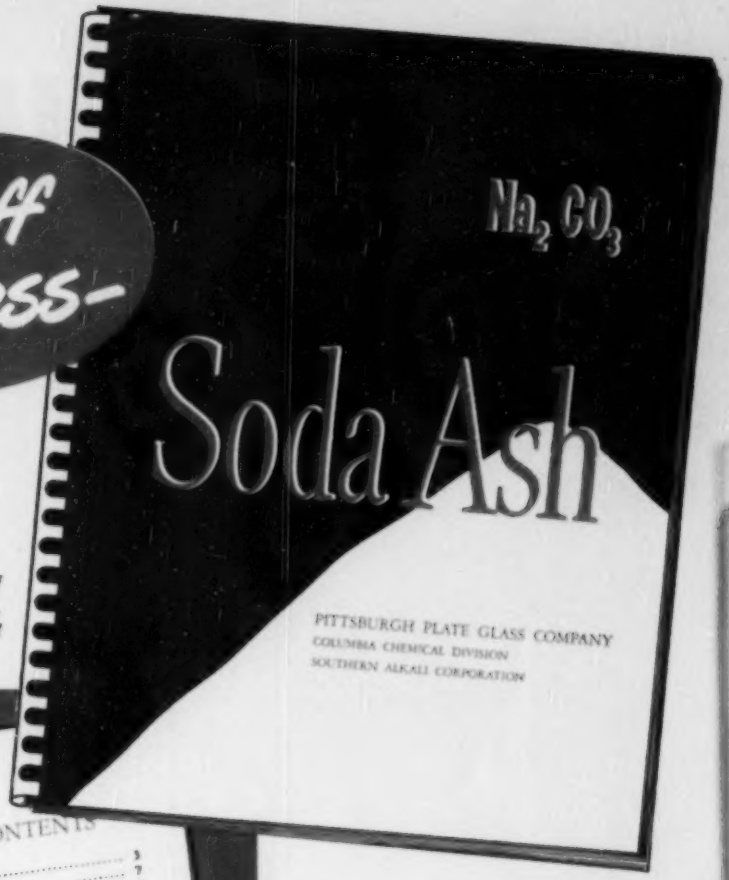
Now the minimum is being raised, after hearings last November, and the industry is being split into three groups—disinfectants and insecticides, industrial chemicals, and carbon black—with a different minimum in each. Subject to approval of Secretary

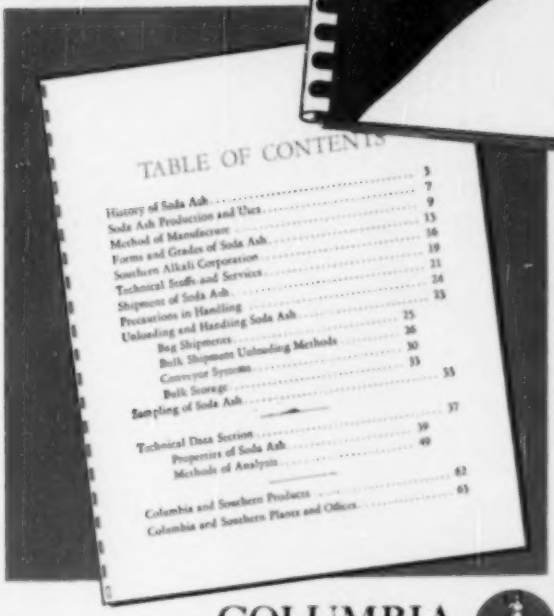
Continued on page 72

Just off the press—

The latest handbook on SODA ASH— and the most complete ever published!

.... *By the Technical Staffs of Pittsburgh Plate Glass Company, Columbia Chemical Division; and Southern Alkali Corporation.*

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The two original rectifier units, both rated at 3500 amperes, 260 volts d-c, have given 96.6% efficiency in their installation [illegible]

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HERCULES POWDER CO.
Hopewell, Va.

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SUPERIOR GAS & EQUIPMENT CO.
Philippine Islands

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U. S. METALS REFINING CO.
Cartaret, N. J.

•

MARATHON PAPER MILLS OF CANADA, LTD.
Marathon, Ontario, Canada

•

IMPERIAL CHEMICAL INDUSTRIES, LTD.
Cheshire, Runcorn, England

•

PENNSYLVANIA SALT MFG. CO.
Wyandotte, Mich.

•

FIELDS POINT MANUFACTURING CORP.
Providence, R. I.

These companies join the growing list of users of the mechanical rectifier. The many adv[illegible]nical rectifier

[illegible] *I-T-E Mechanical Rectifier* [illegible]

FOR APPLICATIONS UP TO 10,000 AMPERES PER UNIT IN THE 30 TO 600 VOLT RANGE

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I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

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THE CHEMENTATOR, continued

of Labor Tobin, it has been decided to fix the following minimum hourly rates: disinfectants and insecticides, 95 c. (85 c. in the South); industrial chemicals, $1.15; and carbon black, $1.40. The definition of each group is that in the Standard Industrial Classification used by the Budget Bureau.

The $1.40 rate would be the highest fixed under the Walsh-Healey Public Contracts Act in any of the 42 industries covered. Nearest to it would be the $1.23 rate fixed for the steel industry in certain areas.

A 95-c. minimum was set in the soap industry last February. Hearings were held in September on the paint and varnish industry.

Chemical industry in readiness

The chemical industry should be better able to serve new military demands that may arise than at any time during World War II, thinks President Leland I. Doan of Dow.

His own company, Doan points out, has grown three and one-half times in plant size since Pearl Harbor. He adds that, while Dow plants are operating at near capacity for the manufacturers of nonmilitary products, conversion in the chemical industry can be accomplished rapidly.

Dow has plant expansion programs under way in several areas. Doan states that the progress made and direction taken will depend almost entirely on the trend of the international situation and subsequent governmental requirements.

Ordnance plants alerted

Dismantling of the Morgantown, W. Va., ammonia plant, 52 percent completed, has been halted on orders from the War Department in Washington. With a capacity of 18,700 tons of ammonia a month, the plant originally was the largest ammonia-producing unit owned by the government and one of the biggest in the country. The change in plans may entail resumption of operations and large-scale reemployment.

Elsewhere, both the Longhorn Ordnance Works at Karvack, Tex., and the Louisiana Ordnance Works at Shreveport, La., are being readied for operation if needed. The maintenance program at both has been stepped up. This action has been taken to prepare for any eventuality that may arise due to the present Korean emergency.

A recent survey of the Longhorn installation has been completed by Monsanto, which operated the plant during World War II.

More furnace black for rubber makers

A new company, Continental Oil Black Co., has been organized. Continental Carbon Co. and Continental Oil Co. are joint owners of the new enterprise. A $1.5 million plant will be erected at Lake Charles, La.; its design capacity calls for production of 25 million pounds annually of high abrasion furnace black from oil. Witco Chemical Co. will be distributor of the plant's output.

The Louisiana Board of Commerce & Industry has approved a 10-year tax exemption for the new plant.

Construction is already getting under way. The plant is scheduled for completion early in 1951. It will be located just east of and adjacent to Continental Oil's refinery.

Raw material for the new plant will be piped direct from Continental Oil's refinery.

The recent government directive designed to conserve the use of natural rubber, plus the rise in the use of cold rubber, is expected to stimulate substantially the demand for high abrasion furnace black. A portion of the output of carbon black will be funneled into the expanded synthetic rubber production along the Gulf Coast.

Unsung hero: reclaim rubber

There's a boom on in reclaim rubber as the nation turns for help to one of the "unsung hero" industries of World War II. B. F. Goodrich has reopened a reclaim plant in Akron; it's to be in full production early this fall.

Current production of reclaim rubber is running at the highest rate since 1943, the peak year of World War II output, according to T. G. Graham, Goodrich vice president. Recent government restrictions on the use of crude and synthetic rubbers, combined with high prices for crude, are responsible for the reclaim boom that may boost production to 300,000 long tons, topping all previous records.

Reclaim production, based on normal working schedules, has been virtually sold out during recent months. And total manufacturing capacity of the reclaim industry will soon be taxed to the limit.

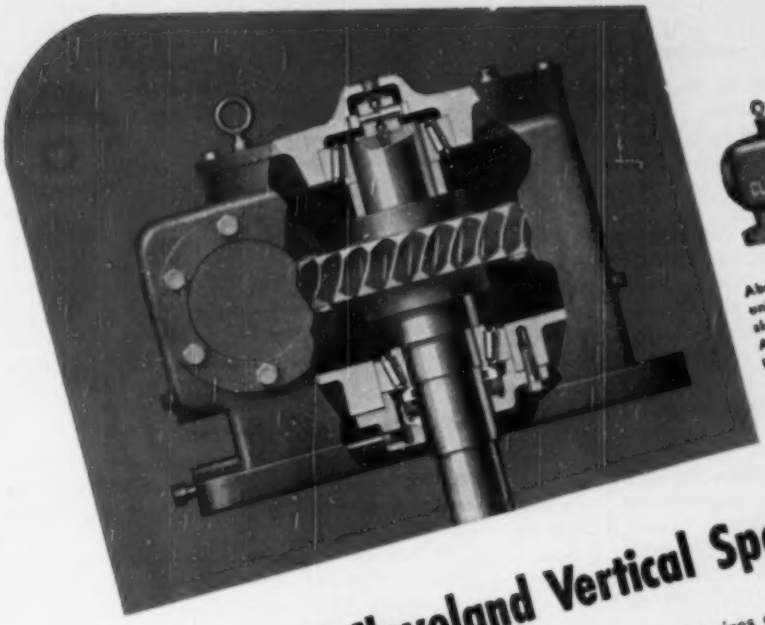
War needs end octane race

Mark up another Korean war casualty. It's the oil industry's octane race. A cut of several points in gasoline octane ratings is in the cards within the coming months.

Military demands for aviation gasoline are increasing. That means that octane components will have to be diverted to aviation gasoline. And gasoline for civilian automobiles will suffer—though oil men say its quality will hardly get as low as it did in World War II.

The end of the race to hike up civilian gasoline quality will come as a relief to many refiners, especially the smaller ones who have almost reached their limit in upgrading gasoline without adding costly equipment. If the military siphons off high-octane components

(*Continued* on page 74)



Above—Exterior view Type ND unit. NU unit (not shown) has slow-speed shaft extending up. At left—Cutaway section to show tapered roller bearings on gear shaft, positive face-type oil seal, unique lubricating pump and oil drain at base of housing.

A new series of Cleveland Vertical Speed Reducers

● NU and ND worm gear units—in seven sizes each (50 to 500) are ready for prompt delivery. They are particularly suited to such equipment as agitators and mixers, and to overhead chain conveyors as well.

Outstanding features which insure that these new vertical drives will deliver long and trouble-free service are:

Extra heavy tapered roller bearings on gear shaft.

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Positive face-type oil seal below lower gear shaft bearing to prevent leakage.

Heavy base flange extends around all four sides. All parts liberally sized and precision built.

Write for Bulletin 125 for full description of Types NU and ND, including capacity charts and dimension data. The Cleveland Worm & Gear Co., 3273 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.

like alkylates and toluene, the small refiners will be in a better competitive position.

In World War II, the Petroleum Administration for War set maximum octane limits for civilian gasoline. At war's end, these were 75 for premium, just under 70 for regular.

Oil men doubt there will be similar octane regulation now—unless all-out war starts, with full regulation and rationing. Nor do they expect direct octane regulation by the industry. Instead, they think the same end will be achieved by agreed diversion of octane components. The extent of the diversion, of course, will control the antiknock qualities of the gasoline that motorists and truckers get.

Scarce soda ash

When 2,000 striking members of District 50 of the United Mine Workers at Syracuse, N. Y., ratified a contract with Allied's Solvay Process Division on September 22, a total of 3,000 soda ash workers returned to their jobs. It looked as though the end of the crippling soda ash strike were imminent.

The Syracuse settlement was expected to provide the pattern for ending strikes at three other plants. The Solvay plants at Baton Rouge and Detroit still were strikebound at the time, although some production had been resumed. Negotiations with about 1,500 workers were continuing on the local level. Also struck was Diamond Alkali's Painesville, Ohio, plant, employing about 3,000. Out in Michigan, 2,500 employees had already returned to work in the three plants of Wyandotte Chemicals.

The Syracuse workers had been out 102 days. But they didn't get the John L. Lewis type of employees' pension that District 50 had tried to impose on the alkali industry. Instead, they settled for a 10 c. hourly raise, with another 5 c. next June.

Even after the strike ended, it would take about two weeks to get production started. Not before the middle of this month could full production be expected. Meantime, industry has been plagued by a scarcity of caustic, chlorine and soda ash.

Hardest hit have been the glass manufacturers—and their customers in the food, dairy, beverage and pharmaceutical industries. Other sufferers: makers of rayon, textiles, paper, synthetic rubber, detergents and phosphate chemicals. Victor Chemical Works has had to cut back production in four of its plants; its two phosphorus plants have been threatened. Shortages of chemicals have hampered de-mothballing of naval vessels and military equipment vitally needed in the defense program. Several Atomic Energy Commission plants have announced that the soda ash shortage would affect work on atom bombs. Even distillers of Kentucky bourbon have been hit—not being able to get bottles.

The trouble began back on June 12, when District 50 called out workers at Solvay plants at Syracuse, Detroit and Baton Rouge. On July 22, the union struck Painesville, largest of Diamond's 12 plants. Wyandotte's three Michigan plants followed on September 5.

Before the strike, the soda ash industry was running at from 80 to 85 percent of its annual capacity of 5.6 million short tons. Chances are that after Korea this would have been speeded up to 90 percent. At this rate, best estimates are that the strike cost about 630,000 short tons of production. And that loss will probably be a net deficit for a long time to come.

Radioactive tracer techniques

Powerful new tool for the process industries, according to Dr. Johan Bjorksten of the Bjorksten Research Laboratories, is the use of radioactive tracer techniques.

"Much time and power are wasted in mixing operations in industry today," says Bjorksten, "because it is difficult to determine when a mixture is well mixed. This applies to food manufacture, metallurgy, cosmetics, textiles and nearly every form of industrial operation. By use of 1 mg. of radioactive potassium salt, for example, incorporated in a production batch of 10,000 gal., it is possible to tell almost instantly how effectively and how thoroughly the batch is being mixed and when it is completed. This can save hours of production time, improve quality and create considerable cost savings.

"Besides radioactive potassium, many other radioactive elements are available at nominal cost. For development work in electroplating, or as a tracer for steel, there is available radioactive chromium. For the pigment, paint, lacquer or the printing ink industries, there are, in addition, radioactive titanium oxide, cadmiums and zinc. With these radioactive metals, pigments can be made and the rate of wear of test samples of paint can be determined virtually in a number of days, instead of years as is the case today.

"Radioactive phosphorus, iodine, chlorine and sulphur are other tracers which lend themselves to production improvement in the fertilizer, solvent, detergent and mining industries.

"Actual applications of these techniques are under way today in the oil industry, in pharmaceuticals and, to a limited extent, in machinery production. The field is still in its infancy. But the tools have been developed; they are here to be used by industry."

AEC keeps Ohio plant busy

Three eight-hour shifts are now in force daily at the Willoughby, Ohio, plant of Barium & Chemicals, Inc., which is engaged in production of materials for the atomic energy program. —*End*

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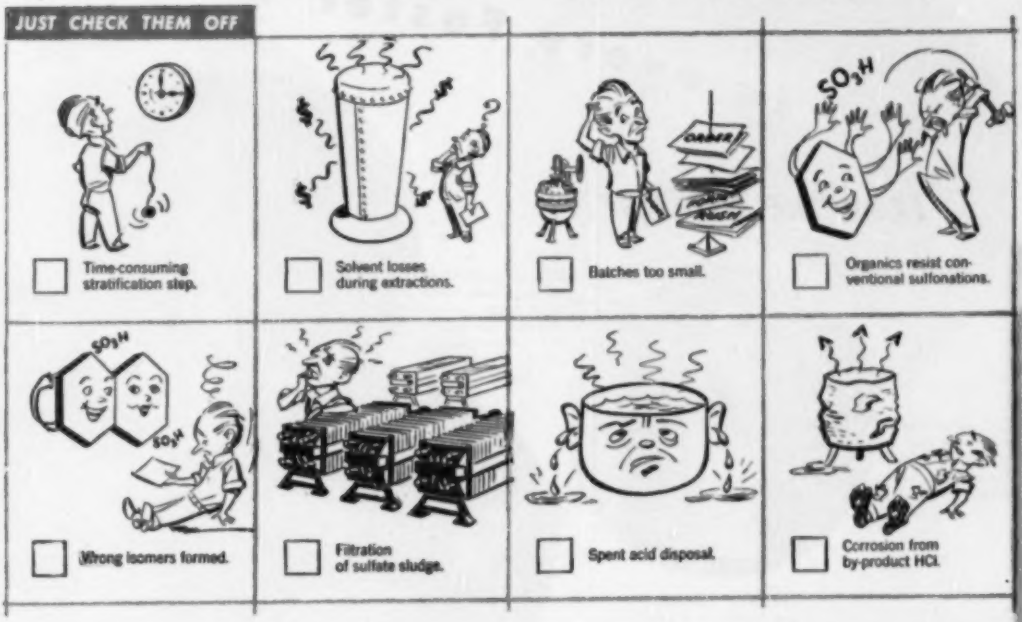

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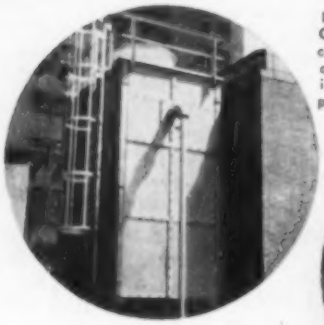
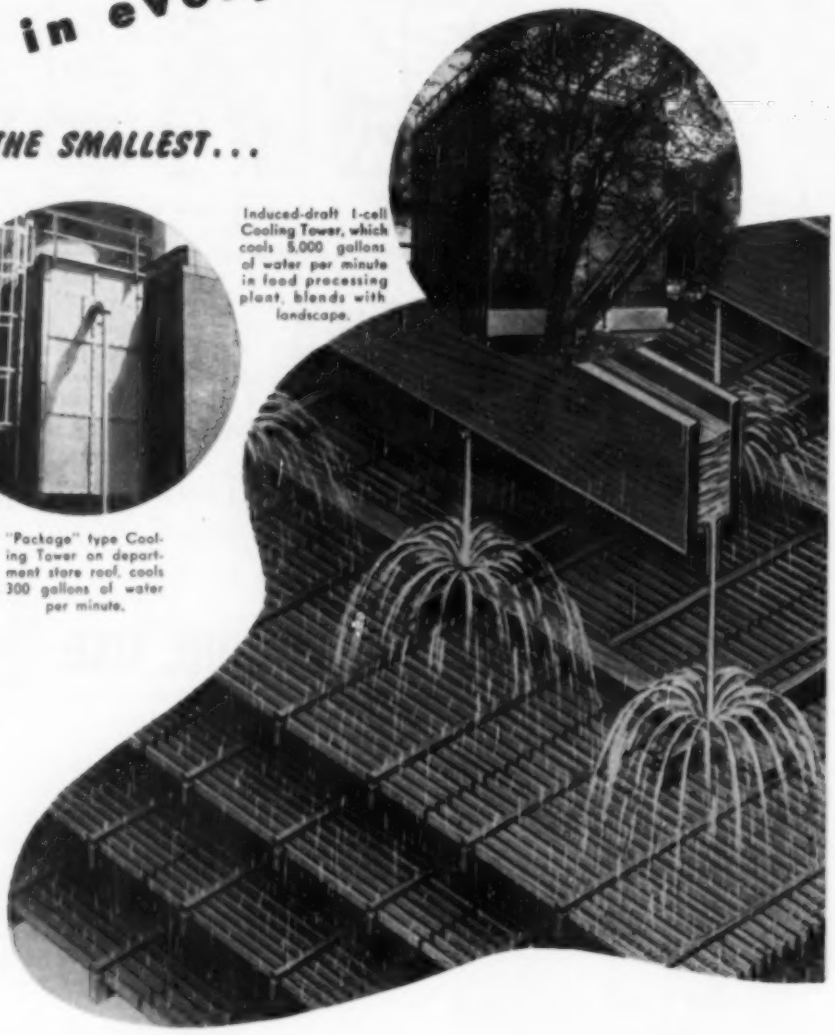


"Package" type Cooling Tower on department store roof, cools 300 gallons of water per minute.

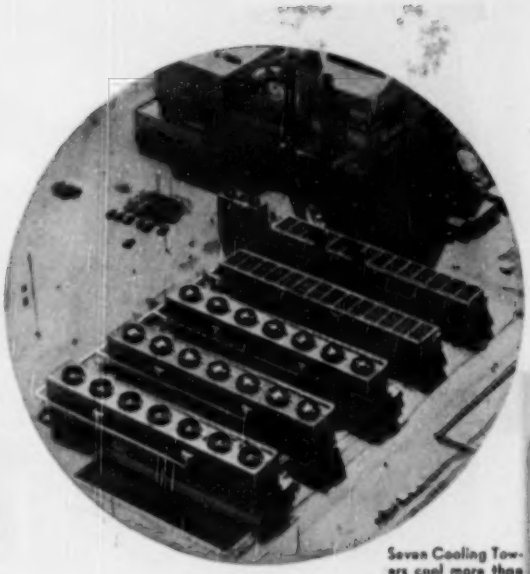
Induced-draft 1-cell Cooling Tower, which cools 5,000 gallons of water per minute in food processing plant, blends with landscape.



FOSTER WHEELER CORPORATION 165 BROADWAY

cooling tower

Induced-draft 6-cell Cooling Tower in oil refinery cools 10,300 gallons of water per minute.



Seven Cooling Towers cool more than 180,000 gallons of water per minute in large power plant.

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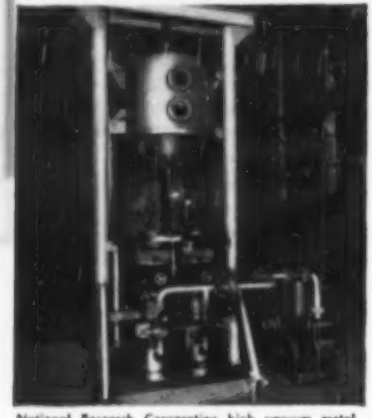

National Research Corporation high vacuum metallurgical furnace. Kinney Pump used for roughing and for backing diffusion pumps. In high vacuum furnaces metals like Titanium, Zirconium and Molybdenum are being cast or treated in the pure gas-free state. These vacuum-processed metals display new qualities of ductility and conductivity . . . new advantages made possible by Kinney-created low absolute pressures.

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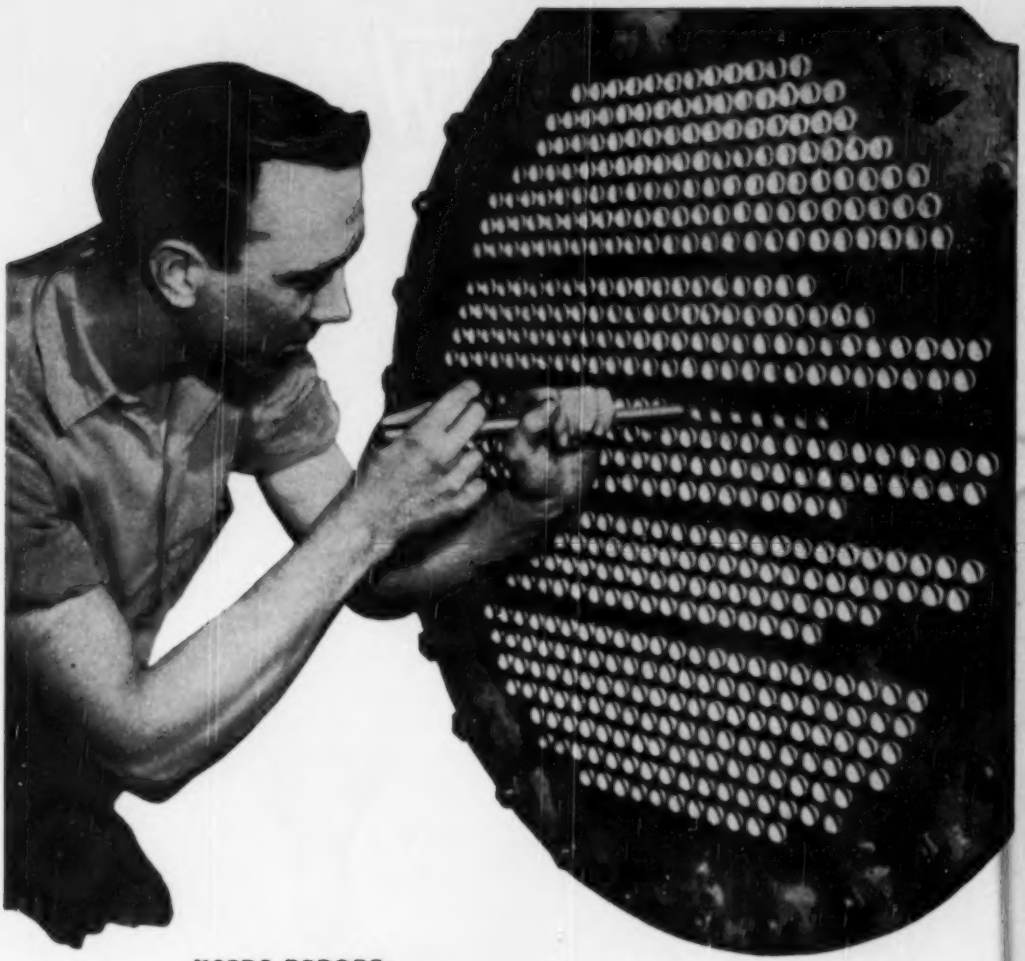

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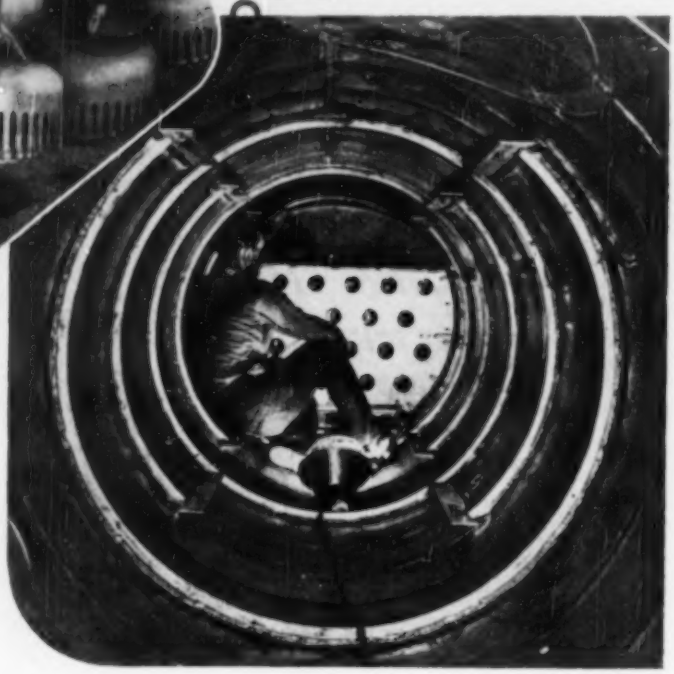
Stainless Steel bubble caps being installed on a Stainless tray. The manufacturer is C. F. Braun and Co., Alhambra, Calif. (Patents Pending)

Workman installing removable Stainless Steel trays in a crude stabilizer. This equipment, too, was fabricated by C. F. Braun and Co.



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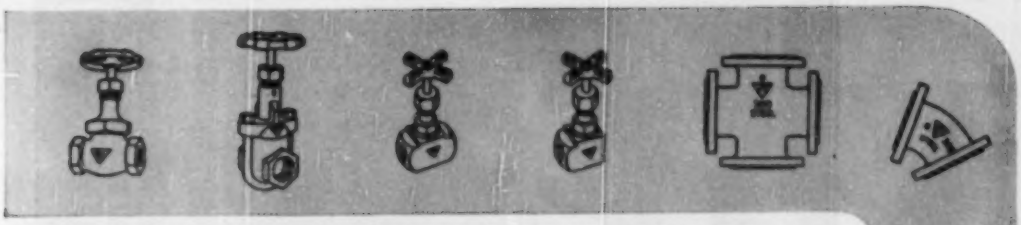

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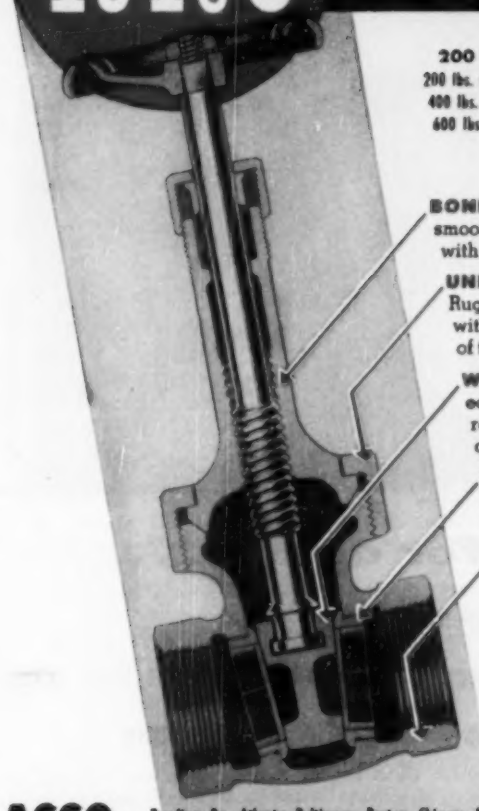

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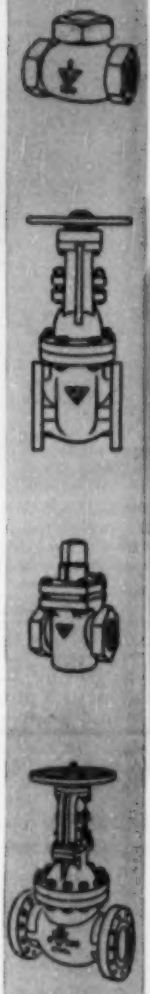

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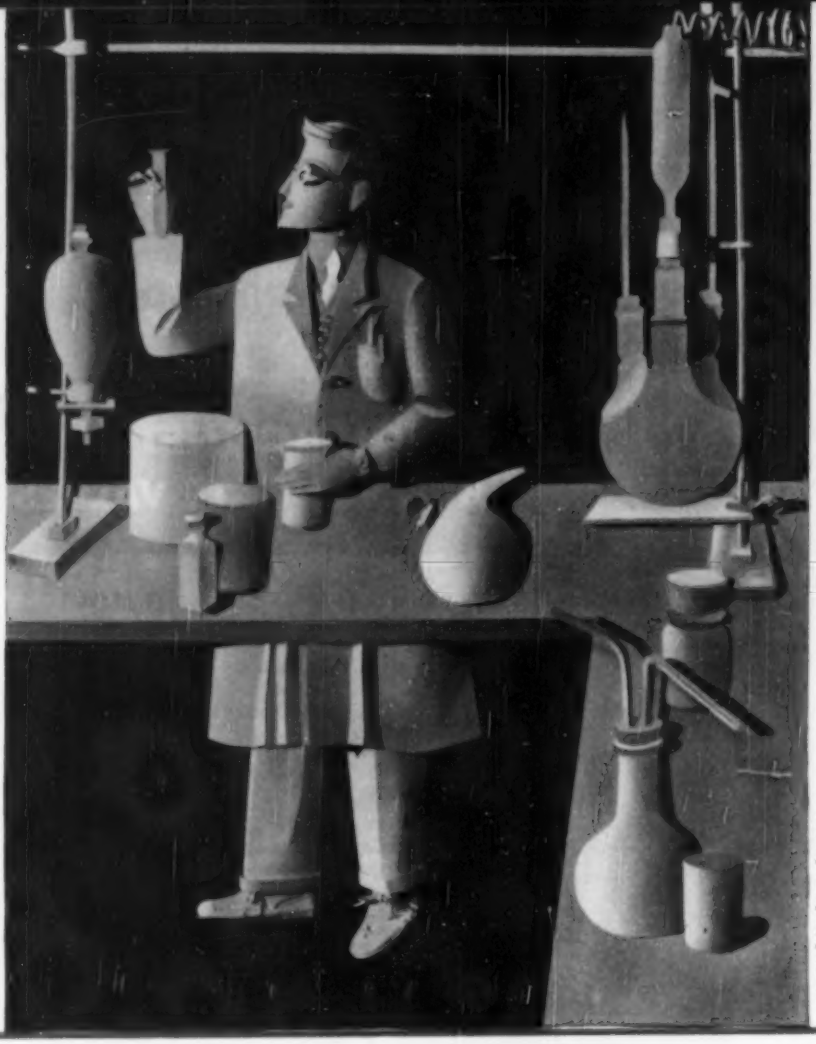

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(1) Is the proposed equipment built by a reputable manufacturer with years of experience?

(2) Has the manufacturer facilities for research and testing?

(3) Are units tested in accordance with the Standard Test Code?

(4) Are the services of experienced engineers available in the field?

(5) Will the manufacturer (if practical) furnish equipment for comparative tests?

If you consider the merits of the air handling equipment you are about to specify on your jobs in the light of these points, we're certain you'll agree that American Blower offers more value per dollar invested.

Phone our nearest branch office for data or consult your Heating, Ventilating and Air Conditioning Contractor.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

YOUR BEST BUY

AMERICAN BLOWER

AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Jeffrey Spiral Conveyor shown here is handling lime and alum in a large Water Works plant. Note the clamped cover used when dusty material is encountered . . . also the various rack and pinion valves in trough bottom for delivery of material when and where needed. A spiral flight is shown also.

THE SPIRAL CONVEYOR IS A COMPACT UNIT

You can save time and money by using a Jeffrey Spiral Conveyor. A neat and compact installation — no return strand. Capacities vary with size of conveyor. Handles many kinds of material at low cost.

Sectional, Flight, Helicoid, Mixer, Cut Flight, Ribbon and Cast Iron . . . six types manufactured by modern methods with equipment especially designed for the purpose. Uniform strength, perfect fit and true alignment assured.

Jeffrey Spirals are interchangeable with other standard makes . . . are built to industrial standards. Try one on your next handling job whether it's coal, raw sugar, grain, salt cake, cement, carbon black, grape fruit or orange rinds, etc.

Catalog No. 803 fully describes and pictures Jeffrey Spiral Conveyors. Send for it today.

THE JEFFREY MANUFACTURING COMPANY Established 1877

909 North Fourth St., Columbus 16, Ohio

Baltimore 2 Boston 16 Cincinnati 2 Detroit 13 Jacksonville 2 Philadelphia 3 Salt Lake City 1
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Birmingham 3 Chicago 1 Denver 2 Houston 2 New York 7 St. Louis 1

Jeffrey Mfg. Co. Ltd., Montreal, Canada
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.
The Ohio Malleable Iron Co., Columbus, Ohio
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Complete Line of Material Handling, Processing and Mining Equipment

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You Get

GREATER PRECISION

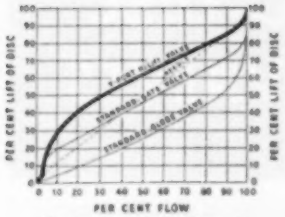
IN MANUAL CONTROL OF FLOW

WHEN YOU USE THE

HONEYWELL

HI-LIFT VALVE

WITH MICROMETER INDICATION



Flow characteristics of the Honeywell Hi-Lift Hand Control Valve far surpass those of conventional designs . . . offer favorable comparison to the precision of such diaphragm operated control valves as the Honeywell Series 700.

COMMERCIAL • RESIDENTIAL • INDUSTRIAL

WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL

THE Honeywell Hi-Lift Hand Control Valve is ideal for use where automatic regulation is not necessary or advisable. Designed to afford micrometer adjustment of flow, it contains an indicating scale to show percentage of stem travel to 1% and an inner valve capable of responding to such close correction. Inset illustration shows the simple and easy-to-read scale and the curve at left portrays the superior flow characteristics of the Hi-Lift over conventional valve designs.

The Honeywell Hi-Lift is available with v-port or parabolic discs . . . in sizes from ¼" to 12" . . . straight through or angle . . . for pressures up to 600 lbs. . . . with body of Bronze, High-Tensile Iron or Cast Steel . . . and with Bronze or Stainless Steel trim. Available, too, with electric motor for remote control applications.

Call in your local Honeywell engineer for detailed information about the Hi-Lift and such other Honeywell Process Control Specialties as: Transfer Valves, Liquid Level Devices, Cylindrical Plug Valves and the Honeywell Space-Saving Bypass. *Write, today, for a copy of Bulletin #242-1!*

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Avenue, Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

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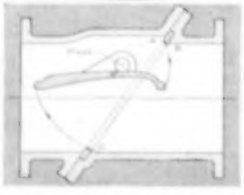
VALVE PRODUCTS

STOP Destructive Pipe-Line Stresses

with CHAPMAN TILTING-DISC CHECK VALVES

IT'S THE VALVE WITH CUSHIONED CLOSING!



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

When you reduce slamming you reduce the hazard of rupturing pipe lines, opening up joints . . . . a host of maintenance problems.

That is why we suggest you investigate Chapman Tilting-Disc Check Valves. The balanced disc in this unusual valve lifts away easily in opening . . . rides smoothly on the flow . . . closes quickly but quietly. There's no slamming . . . minimum wear on valve parts and minimum stresses on pipe lines.

Special designs with dashpots are also available for use under unusual operating conditions, where no self-acting Check Valves can function satisfactorily.

Made in both iron and steel . . . pressures up to 3000 pounds.

You'll find it will pay you to write today for more information on this valve developed by Chapman. Request Bulletin #30.

The Chapman Valve Mfg. Co.

INDIAN ORCHARD, MASSACHUSETTS

What's in a name?

Even in Shakespeare's time, craftsmen would have disagreed that " . . . a rose by any other name would smell as sweet" . . . for names were signed to products only after proven ability and long apprenticeship. Today, more than ever, names like SIVYER, are a symbol of integrity and value. The ◇S◇ on a SIVYER casting is bestowed only after minute inspection, careful precision labor, and many technical processes. That's why so many famous names use the SIVYER ◇S◇ to guarantee the integrity of their own products.

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Just as a hallmark identifies silver, and a crest a family pedigree, better high alloy and steel castings are recognized by the famous SIVYER ◇S◇ . Inquiries promptly handled.

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Jones

WORM-HELICAL SPEED REDUCERS

60 YEARS 1890 1950

Jones Worm-Helical Speed Reducers are high efficiency units built in fifteen standard ratios from 40 to 1 to 250 to 1 for all common motor speeds. They are ideal for vertical shaft drives to agitators, mixers, bending rolls, etc.

The low speed shaft can be extended up or down, for coupling connection or gear drive.

Bulletin No. 75 covers complete details.

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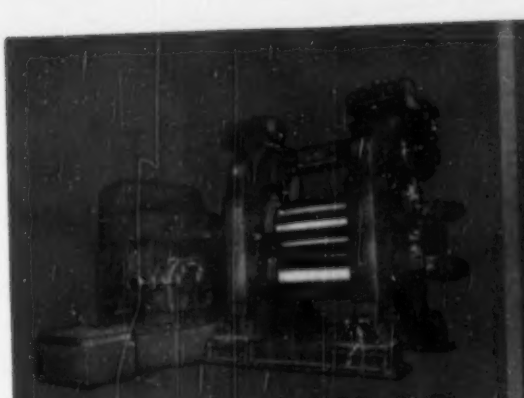
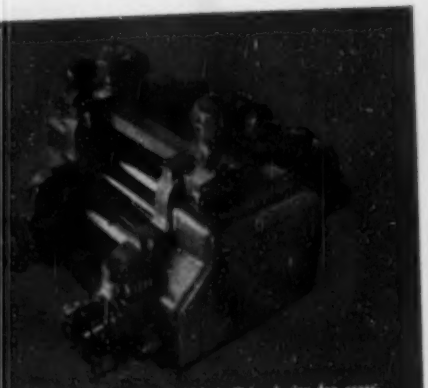
PULLEYS • GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • FLEXIBLE COUPLINGS

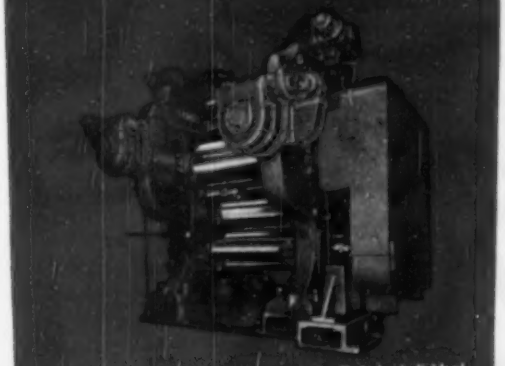


This two-roll calender has its gearing enclosed in a separate fabricated steel housing and connected to the rolls by universal couplings.



New four-roll Z-type calender with built-in device for crossing the roll axes to compensate for roll deflection. Hydraulic pullbacks eliminate backlash and hold the rolls firmly in their operating positions.

Two-roll inclined linoleum calender mounted on wheels for roll travel from oven to oven, with individual right angle motor drive for each roll, and individual motor adjustment for each screw of top roll.



In this four-roll calender, adjustment of rolls is by individual motor. Push-button control provides for adjustment of either roll end separately or both together.

WHAT IS NEW IN CALENDER DESIGN?

In the last few years, Farrel-Birmingham has been responsible for many developments in the design of heavy equipment used in initial processing of rubber and plastics. New machines have been brought out, and conventional types have been modified and improved to meet changing requirements.

Among recent refinements in the design of calenders are:

1. Precision sleeve bearings with hydraulic pullbacks for holding rolls in positive operating position.
2. Improved lubrication system which provides for rapid circulation and cooling of oil to roll neck bearings.
3. Improved oil seals which retain oil in boxes and prevent contamination of stock.
4. Rolls drilled for more effective temperature control.
5. A built-in device which provides means for crossing the roll axes to compensate for deflection.
6. Roll adjusting mechanisms that permit finer adjustment of either roll end separately or both together.
7. Drive and connecting gears removed from calender and enclosed in a separate housing.

In addition to refinements such as these, great strides have been made in designing housings, journal boxes and other parts of the proper materials, proportions and weights to withstand the stresses and strains encountered in processing a wide variety of stocks at higher speeds.

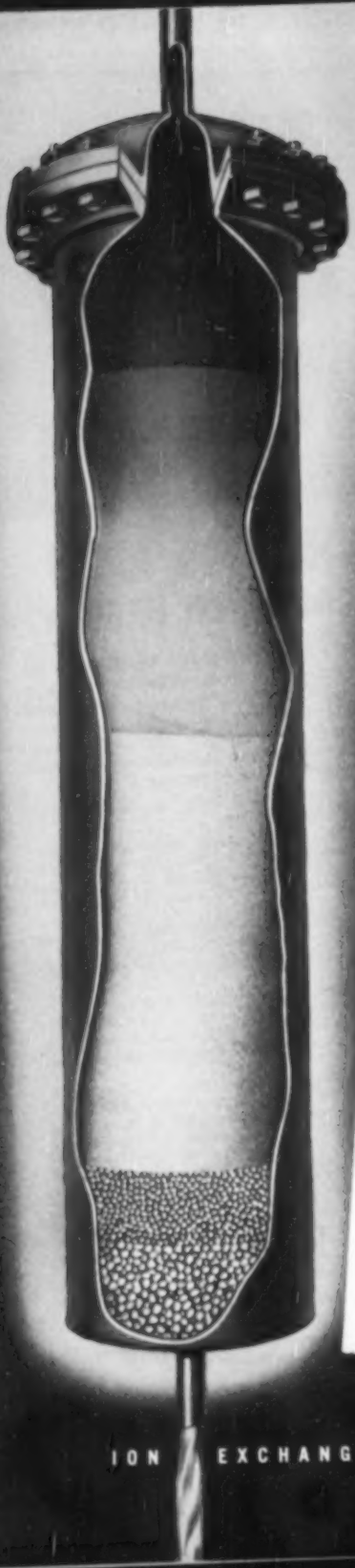
When you need a calender, why not ask Farrel-Birmingham engineers to make recommendations. Their extensive experience in designing calenders for all kinds of uses is invaluable in selecting the right machine for any specific purpose.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham ®

FB-621



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DECOLORIZING RESIN

PERMUTIT DR®

Here is a radically new development for decolorizing solutions! Efficient as bone char or vegetable carbons, Permutit DR makes it possible for the decolorization to be carried out entirely in the liquid phase. Color removal, regeneration of the absorbent by alkali, and return to service are accomplished automatically. No heat is needed at any time during the process.

Permutit DR means low operating costs, because it can be used over and over again. The resin imparts no taste or odor to solutions. Decolorization has been found especially promising in the sugar, food and pharmaceutical industries.

Samples of this amazing resin are available on request. Our engineers will be glad to cooperate in the solution of your problems. Please send details to The Permutit Company, Dept. CE-10, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

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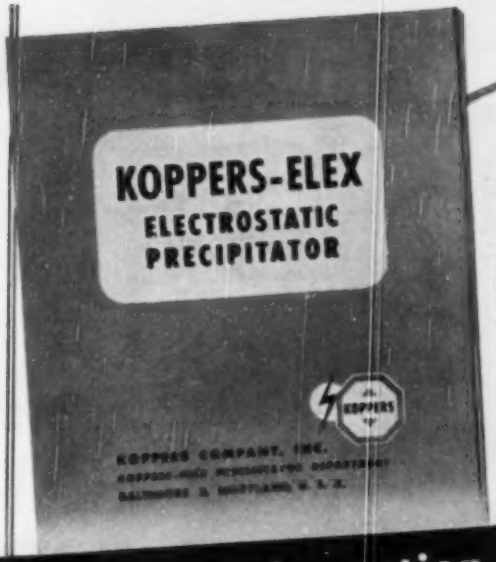
Booklet Describes How . . .

One factory specified 97% efficiency, but actually gets over 99% efficiency!



SEND FOR THIS VALUABLE FREE FOLDER!

Gives vital information on how to make recovery, gas cleaning and nuisance abatement pay off!

Improved power units save money on installation cost.

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Insulators, protected from gas stream, require minimum maintenance and replacement!

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High efficiencies are obtained around-the-clock for a full 24 hours a day!

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New engineering on certain industrial gas applications enables recovery to pay up to 75% annual dividend on original cost!

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You can get both specified efficiency and residual content left in gas unconditionally guaranteed!

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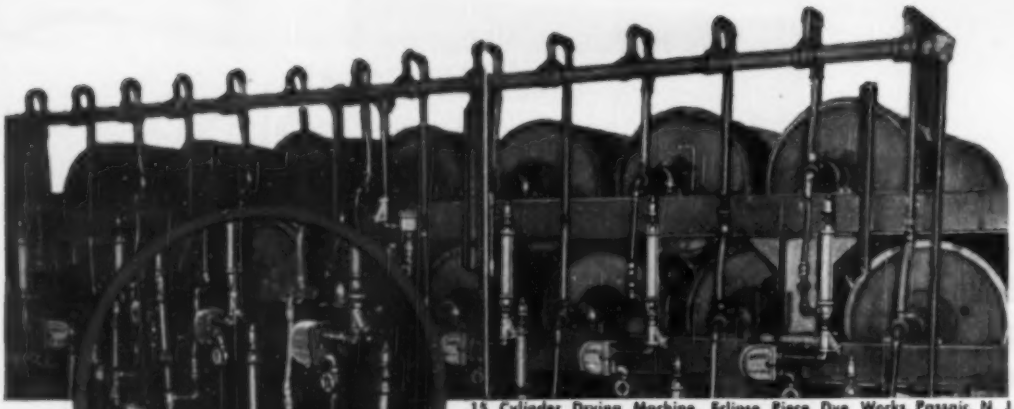
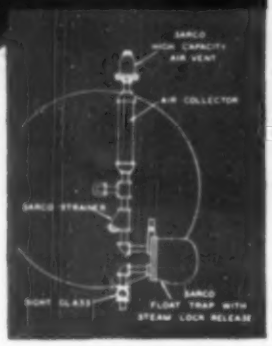


15 Cylinder Drying Machine, Eclipse Piece Dye Works, Passaic, N. J.

SARCO INCREASED CLOTH DRYING PRODUCTION 10 *to* 15%



The Sarco System is a packaged unit—ready to install and made up of time tested, Sarco elements which have given satisfactory service for years.

An investment of less than 1% of the original cost of this 15 cylinder drying machine increased its production 10 to 15% — with the Sarco Drainage System. Because all condensate and air are removed continuously, all parts of every cylinder are always hot. No air binding — no water logging — no steam locking; and you get a dollar's worth of usable heat from every dollar's worth of fuel you buy.

Warm-up time is also greatly reduced. In one plant, 2½ hours are saved every time the machine is started up — in this case a dozen times a week.

This is only one of the ways Sarco Saves in textile plants. Elimination of condensate and air, and temperature controls are working wonders. For instance, Sarco experience in using hot condensate for other purposes may save thousands of dollars in your plant.

Sarco products also include self-operated and electric controls for all wet process operations. Write for the catalogs.

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SAVES STEAM

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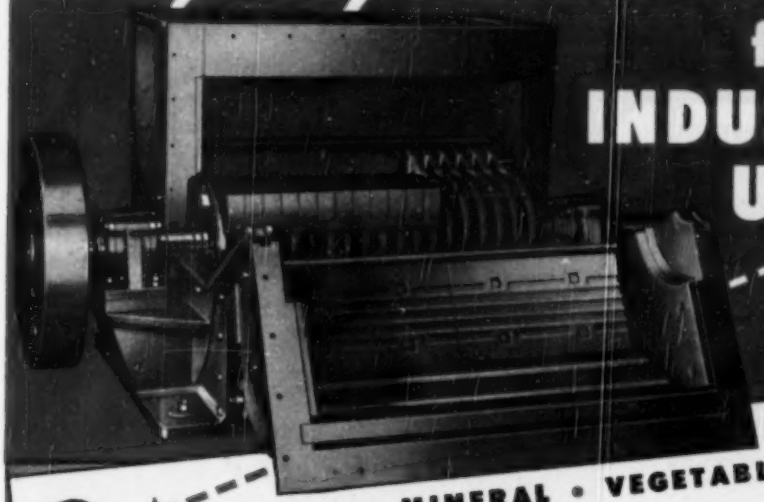
WILLIAMS
Heavy Duty HAMMERMILLS for INDUSTRIAL USE



Reduce ANIMAL • MINERAL • VEGETABLE MATTER

CHEMICALS, SOAP CHIPS, ETC.
Many dry chemicals are being ground with Williams Heavy Duty Hammermills. Capacity is unusually high and power involved and maintenance extremely low.

OIL CAKE (INCLUDING SOYA), COPRA AND COTTONSEED
Such material, easily ground for use as animal food, whether it is expeller cake or hydraulic press cake.

ANIMAL AND FISH BY-PRODUCTS
Hundreds of installations are daily proving our claims for better and more satisfactory reduction of such materials as — cracklings, tankage, fish scrap, raw and dry bones, etc.

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Many canneries, breweries, and municipalities reduce waste materials for disposal with Williams Heavy Duty Hammermills prior to flushing through the sewers with water.

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Such materials are readily reduced to "hand shovel" size for easier handling. A metal trap catches studs, bolts and other uncrushables.

ROOTS, HERBS, BARK AND CHIPS
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STANDARD DESIGNS FOR BIG OR LITTLE JOBS
Standard machines are available for the reduction of practically every material. Capacities range from 50 to 600,000 lbs. per hour.

WILLIAMS ALSO MAKES . . .
Impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

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Submit your grinding problems to Williams. A sample of the material and description of the desired result will set our facilities to work on a solution to your problem. Visits during test runs and technical consultations are invited.

WO-50-1

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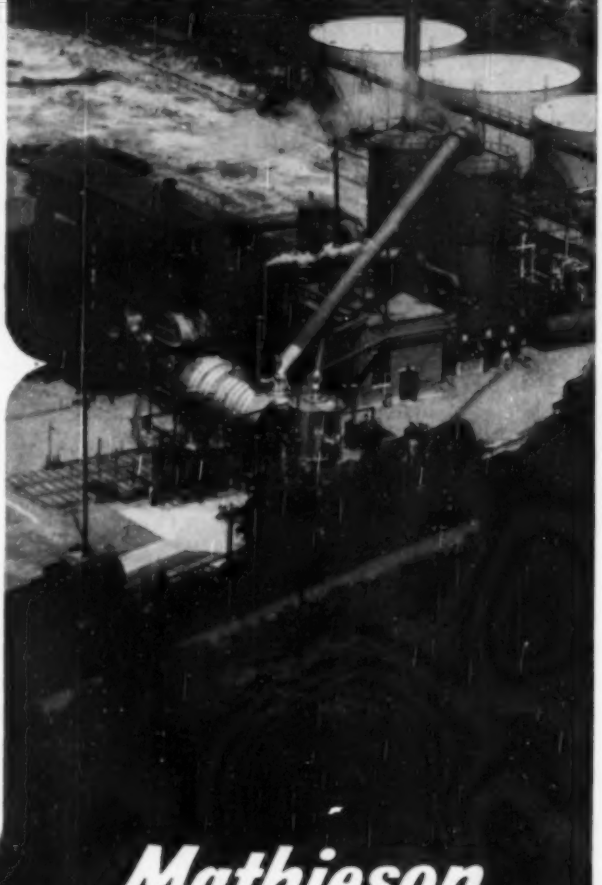
CRUSHERS **GRINDERS** **SHREDDERS**

OLDEST AND LARGEST MANUFACTURER OF HAMMERMILLS IN THE WORLD

3 Points that favor using MATHIESON SULPHURIC ACID



1 **UNIFORMLY HIGH PURITY**—Mathieson Sulphuric Acid is clear, colorless and free from such impurities as arsenic, selenium and tellurium because it is made exclusively from pure elemental sulphur in modern equipment.

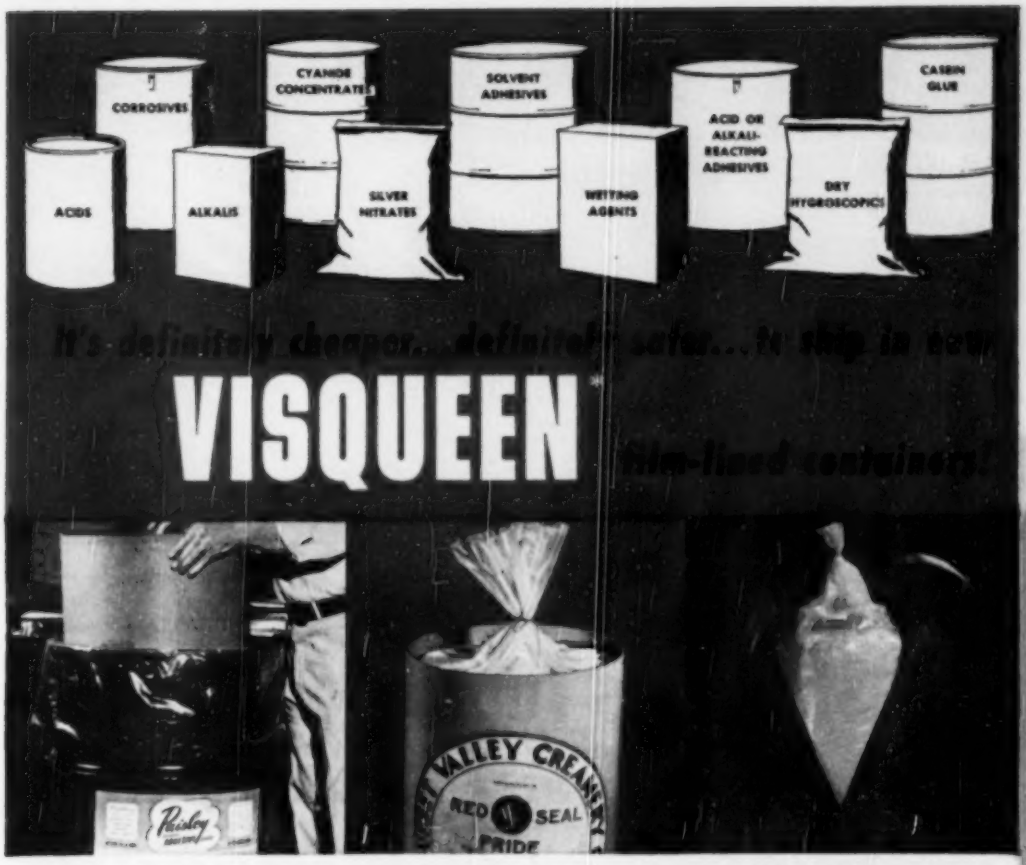
2 **FULL SELECTION OF GRADES**—Mathieson Sulphuric Acid is available in all commercial grades, ranging from 60° Bé. to oleum, 20%.

3 **BULK SHIPMENTS**—Mathieson Sulphuric Acid is available in tank trucks, tank transports, tank cars and tank barges from Baltimore, Md.; and in tank cars from North Little Rock, Ark.; Shreveport, La.; Beaumont, Port Arthur and Pasadena, Tex.

Mathieson—with its great manufacturing facilities including two of the largest sulphuric acid units in the world—makes not only sulphuric acid but most of the other basic chemicals and many of their derivatives. Be sure to consult Mathieson in planning for your future supply of basic chemicals. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Md.

Mathieson CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH



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Use VISQUEEN film in

fiber drums

Drastic reductions in tare weight and freight costs—additional savings: no "returns" needed. Example: one California-to-Chicago shipper reported tare weight savings of 5,400 lbs., money savings of $105.84 per car, total annual savings of $50,000. VISQUEEN film liners produce 100% product recovery—unaffected by acids, alkalis or extreme low temperature. Investigate today.

Use VISQUEEN film in

multi-walled bags

Here's the answer to many "impossible" packaging problems! VISQUEEN film liner locks out moisture, positively prevents lumping and caking of product. No spoilage. No leakage. In addition, this type of package has excellent filling, storing and stacking qualities. It's strong, tough. Yet with all these features, it actually costs far less! Write now—get the whole story.

Important!

All VISQUEEN film is polyethylene, but not all polyethylene film is VISQUEEN. VISQUEEN is the only film produced by the process covered by U.S. Patent No. 2461975. Only VISQUEEN film has the benefit of the research and extensive technical experience of The Visking Corporation, pioneers in the development of polyethylene film. Be sure. Always specify VISQUEEN film for superior tear and tensile strength and greater uniformity.

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Give us your toughest shipping problem. Our engineers will try to help you solve it. Write us today.

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The country's largest stocks of stainless tubing and pipe await your call at Ryerson. On hand for immediate delivery are nineteen distinct kinds—both seamless and welded—in a wide range of sizes. Our stocks also include stainless pipe fittings and fastenings for every requirement.

The stainless tubing and pipe you get from Ryerson is of highest quality and meets the exacting requirements of ASTM Specs. You can count on its size accuracy and scale-free finish. You can form and weld it readily, thread it accurately. And when you call Ryerson, America's pioneer warehouse distributor of stainless, you put 25 years of practical stainless experience to work for you.

Ryerson protects the high quality of all stainless tubing and pipe stocks by expert handling. Our facilities include modern equipment to cut your stainless exactly to order and deliver it promptly. So, for complete stainless service, call your nearby Ryerson Plant.

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SIDNEY D. KIRKPATRICK, Editorial Director JOHN R. CALLAHAM, Editor

Chemical Engineering
WITH CHEMICAL & METALLURGICAL ENGINEERING

OCTOBER 1950

How Vulnerable Your Plant?

Many badly bombed plants in Germany continued to operate during World War II despite recurring Allied air raids. Emergency crews became adept in making quick repairs to equipment and vital plant services. In April 1945 I inspected a carbon-black plant near Cologne that drew its gas supply from a complicated grid of pipelines. After each raid new hookups were opened while damaged lines were being put back into operation. In the Ruhr Valley I saw a railroad train completely equipped not only for fire fighting, but with machine tools, cranes, welding and cutting equipment. It played an important part in restoring and maintaining productivity in industries essential to the German war effort. Here in the United States every one of our 103 high-explosives plants had efficient disaster committees that were frequently called into action. Many smaller plants had similar plans, often integrated into those of the surrounding communities.

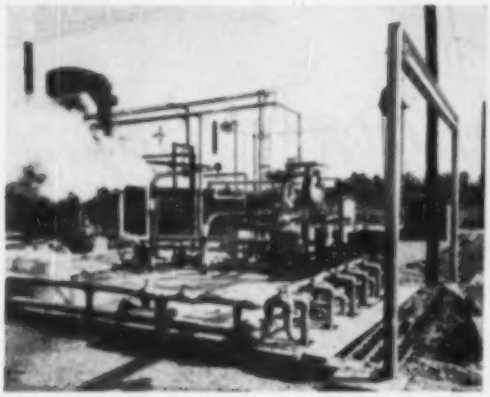
There are many reasons why these lessons so painfully learned in World War II must now be reviewed and put into effect in many plants. Our industries would inevitably be prime targets for attack by an enemy invader. Our enemies know that America's might lies in our great industrial operations, our fuel and electric services, transportation facilities. To cripple that power would be far more effective than the mass destruction of civilians. As engineers and technical men we have a dual responsibility to study and apply the best possible strategy in defense of our plants as well as our homes.

Fortunately we have a great deal of recorded experience to draw upon. Reference has already been made to the safety reports of the U. S. Ordnance Department's operation of its explosives and munitions plants. Last month the Munitions Board of the Department of Defense issued a significant booklet, "Principles of Plant Protection," which can be had from the Government Printing Office for but 15 cents. Foreign experience, particularly in Germany and Japan, has been recorded in the detailed reports of the United States Strategic Bombing Survey. Everyone of us can and should obtain copies of "The Effects of Atomic Weapons," the new handbook prepared under the direction of the Los Alamos group and issued last August by the Atomic Energy Commission. It has been hailed as the most important government document since the Smyth Report. It provides excellent background of scientific and technical information for all civil defense planning.

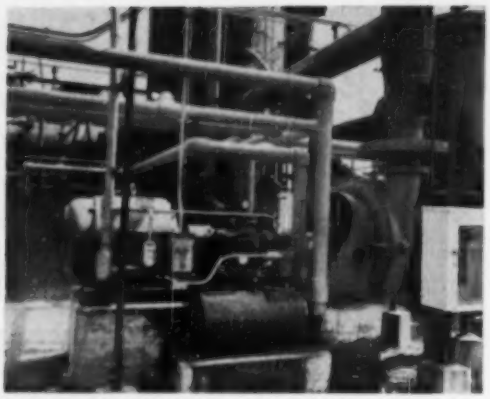
We need not wait for governmental agencies to take the lead in a program of industrial defense. They have already wasted five precious years. Each of us can begin now in our own plants and communities. Committees or study groups should make the preliminary surveys to spot the most vulnerable areas and recommend the obvious steps that should be taken immediately as well as those of long-range significance. Irreplaceable records must be protected, perhaps duplicated by micro methods for safe storage outside of the plant. Flammable and explosive materials can sometimes be isolated or their whereabouts hidden by camouflage. Additional fire fighting, emergency repair and standby equipment will likely be needed and new crews trained for their use. Personnel shelters and underground installations may be required to provide protection against blast, fire and radioactivity. Each phase of the problem must be studied objectively and integrated into the over-all plans for plant defense.

This, as we see it, is a much more serious assignment than ever before. Civil defense, as far as the chemical industries are concerned, can no longer be talked about vaguely, in unrealistic, future tense. Nor is it not a job to be left solely with the safety engineers and fire department. Their work, to be sure, becomes increasingly important, but is only part of the long-range program of plant and personnel protection. Here is where chemical engineering knowledge and experience can prove a most valuable resource. Put it to use.

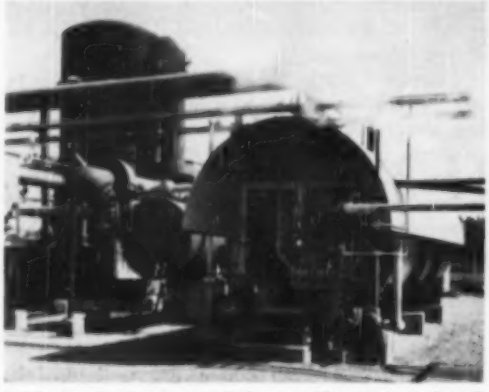
Sidney D. Kirkpatrick



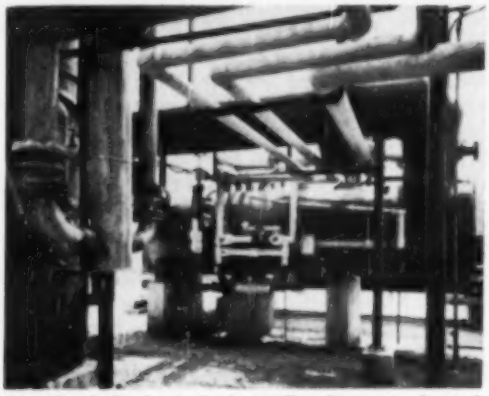
Sulphur melting pit, with small Kelly type sulphur filter and sulphur combustion furnace behind the pit. Filter removes over 90 percent of ash in sulphur.



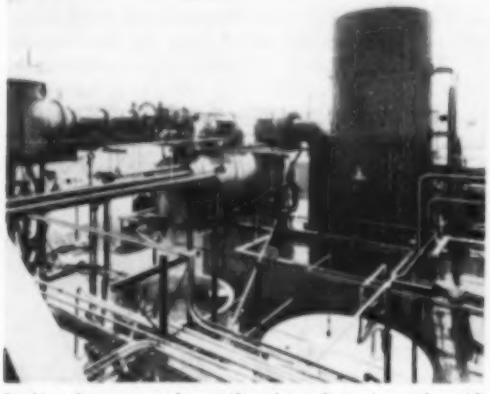
Air blower, showing oil cooler, intake air filter and quench air piping serving converter in the background. Plant requires no drying of combustion air.



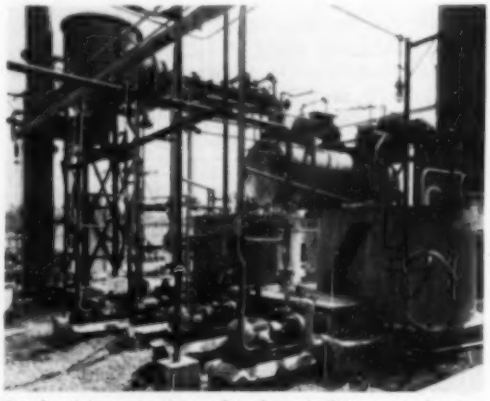
Sulphur combustion furnace discharges a 12 percent gas through a waste-heat boiler into top of the converter. Operating control is by temperature and Reich test.



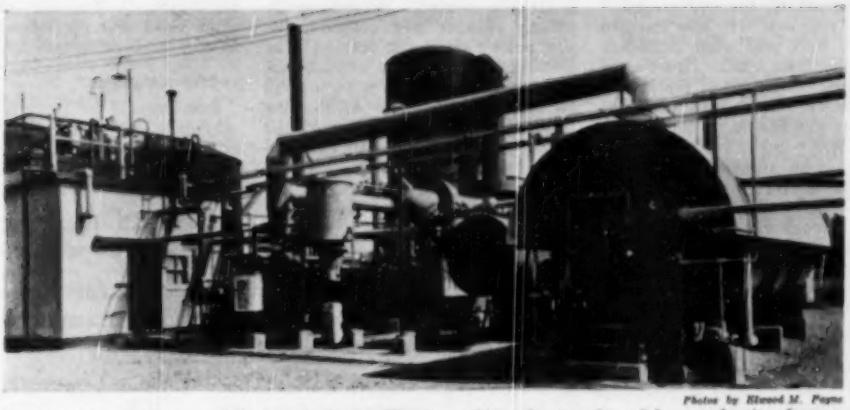
Waste-heat boiler showing level controller. Converter and quench air piping appear at left. Boiler makes 3,000 lb. of 225 psig. steam per hr.



Looking down on product acid cooler and running tanks, with four-stage quench-type converter, absorber, venturi scrubber and cyclone in the background.



Simple piping, pumping and tankage facilities serve the new plant. Construction materials are predominantly steel, lead, Duriron, cast iron and acid brick.



Photos by Elwood M. Payne

American Cyanamid's new sulphuric acid plant at Hamilton, Ohio, showing the sulphur combustion furnace, waste heat boiler, intake air filter, blower and control house in the foreground, with the converter and exit gas stack in the background. The exit gas plume is steam containing virtually no acid mist.

Modern Chemical Engineering Revamps Conventional Contact Process

Except for improvements in detail, in size and in catalysts, the contact sulphuric acid process has hardly changed in over 50 years. A new process now upsets old traditions.

THEODORE R. OLIVE

Since the introduction of vanadium catalysts about 25 years ago, there has until now been no fundamental change in the contact sulphuric acid process. Of course, there have been changes in detail and plants have grown enormously in size, but every plant built has used much the same process steps and much the same equipment. In fact, except for size, details and better catalysts, today's plants are the direct descendants of those built in Europe by Winkler and Knietsch in the latter decades of the last century.

In recent months, however, construction has been completed on a contact plant which retains very few of the traditional ideas. Designed and built by the Chemical Construction Corp. for the Hamilton, Ohio, Works of American Cyanamid Co., its radical new principles follow those developed during the past two years in a pilot plant at Linden, N. J. There the Chemico engineering department started from scratch, and re-examined each conventional step, coming up with a new functional design which eliminates several steps entirely, and modifies most of the others according to modern concepts of chemical engineering.

The consequence is a marked increase in conversion efficiency, a reduction of 90 percent or more in cooling water requirements, a plant greatly simplified from the standpoints of operation, flowsheet and physical layout. Investment and physical size have decreased—the latter, in terms of ground area, as much as one-half to two-thirds—and it has become practicable to build plants of smaller capacity than formerly were economic.

An unusual feature is the ease with which the product concentration can be adjusted to any strength between 60 deg. Be. and 95 percent H_2SO_4. Although a plant of this type could be used for higher strength acid, including oleum, it would lose some of the advantages of the new process and therefore is not at present being recommended for acid over 95 percent.

Because the new plant is simpler, smaller and easier to operate than a conventional plant, it lends itself particularly well to the outdoor type of construction. At Hamilton, only the panelboard and control laboratory are housed, with a simple shelter roof over the burner operating platform.

Two flowsheets appearing on pages 104-5—one of a conventional contact

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T. R. Olive, Chemical Engineering's *senior associate editor, takes you on a trip through a strikingly different contact acid plant.*

plant and one for the new process—show in a general way how the two processes work and what simplifications have been made. However, a part-by-part description of the Hamilton plant will help to make clear just what the significance of the various changes is.

Designed for a capacity of 50 tons of acid per day on a 100 percent basis, the new plant readily produces about 60 tons per day and is currently turning it out at 60 deg. Be. without special dilution equipment. At any time production can quickly be switched to 95 percent acid or any intermediate strength, with only very simple operating adjustments.

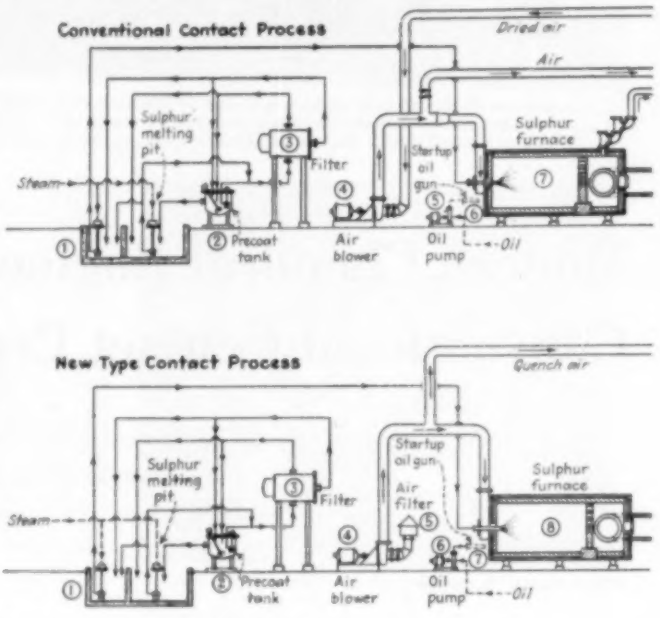
A quick run-through of the new process shows it to be conventional in its earlier steps, except for air supply. From the converter on, however, all steps are novel. One of the most unusual features is that no effort is made to dry the combustion air. Until the final cleanup of exit gas, no effort is made to avoid the formation of acid mist. Nevertheless, the final stack effluent is exceptionally low in both mist and unconverted SO_2.

Both the converter and the absorber differ radically from conventional practice. Where the usual converter is in two stages, with each stage in a separate vessel, the new converter uses four stages in a single vessel. Where the conventional process uses shell-and-tube heat exchange equipment to cool the gases issuing from each stage, the new process cools without heat exchangers by the direct injection of air into the gas stream between converter stages.

Where a packed tower is the absorber for SO_3 in the conventional process, the new process uses a horizontal vessel similar to a Chemico drum concentrater which achieves direct contact of gas and absorption acid in two stages, without packing. More important is the dual function of the new absorber: as it absorbs it also cools by evaporating water from the absorption acid. This feature eliminates the final SO_3 cooler and the large amount of acid cooling equipment needed in a conventional plant, thus reducing cooling water needs by 90 percent or more.

The last step in the new process, which is the one that makes it possible, ordinarily has no counterpart in conventional plants. Since most conventional plants take great care to avoid acid mist formation, there is usually no need to clean up the exit gases, except sometimes in closely settled areas. The new process produces a great deal of mist, as well as steam equivalent to most of the acid cooling requirement. Without an extremely efficient mist collector, the new process could not operate. The collector used is a Pease-Anthony venturi scrubber combined with a small cyclone separator. This reduces the mist loading so effectively that the H_2SO_4 content of the exit gases expressed as sulphur is only about 0.04 lb. per ton of acid produced.

These, then, are the main outlines of the changes one finds in the new process. For those concerned with the details, the flowsheet, the several plant views and the following step-by-step explanation will be helpful.



HOW NEW PROCESS COMPARES WITH THE OLD

Simplification, which is not entirely apparent from a comparison of the two flowsheets, is the keynote of the new process. It eliminates towers, air drying, and nearly all heat exchange and cooling surface. It reduces cooling water needs to a small fraction of those for a conventional plant and cuts ground area to one-half to one-third. At the same time it simplifies start-up and operation and enables product acid readily to be held at any strength from 60 deg. Be. to 95 percent.

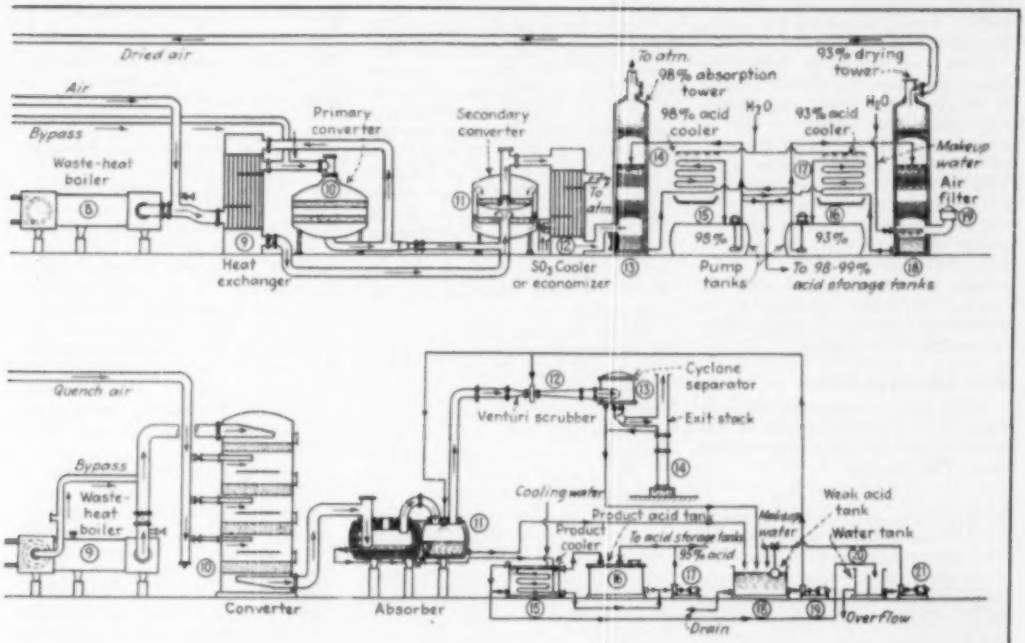
Conventional Process: Sulphur is melted with steam coils in a concrete pit (1), then pumped through a precoated pressure leaf filter (3) for ash removal. Filtered sulphur is kept hot in a separate pit, then pumped to a pressure atomizing burner in the combustion furnace (7) where it is burned with dried air. Air drawn in at filter (19) by blower (4) is dried in tower (18) by contact with 93 percent acid. Drying is necessary to avoid acid mist formation. The combustion gases, containing about 8 percent SO_2, are partially cooled in waste heat boiler (8), then reheated to the kindling temperature of about 850 deg. F. in shell-and-tube heat exchanger (9), thus cooling the partially converted gas from 1st-stage converter (10).

From the exchanger the gases enter converter (10) which is actually a single stage although the vanadium catalyst is in two trays for convenience. Most of the exit gas passes through (9) to the second stage converter (11) which again is a single-stage, two-bed type. The gas leaving (11), now about 96-97 percent converted to SO_3, is cooled against atmospheric air in cooler (12), then flows upward through absorber (13) where the SO_3 is absorbed in 98 percent acid. Tail gases leave the absorber, usually direct to atmosphere or occasionally through an electrostatic or sonic pre-

line to a small stainless steel Oliver Kelly-type pressure leaf filter which has previously been precoated with filter aid. The filter requires cleaning every 24 hr. and removes over 90 percent of the ash, although it takes out none of the organic discoloration, which is not harmful. Filtered sulphur is stored in another portion of the heated concrete pit which holds an ample supply to tide over the filter cleaning periods. A second turbine-driven pump sends the clean molten sulphur through heated lines to the sulphur combustion furnace.

This equipment, of standard Chemico design, makes use of a pressure atomizing burner which in a small plant must be rodded out every 2 hr., requiring a minute of the operator's time. A larger plant would require less frequent rodding. If present knowledge of the burning of dark sulphur had been available when the Hamilton plant was designed, a new type submerged-combustion sulphur burner would probably have been used, with further reduction in equipment size and added simplicity of operation. This burner was used with great success in the pilot plant development of the new process and appeared to offer considerable advantage compared with conventional combustion furnaces.

Combustion furnace operation is controlled manually by temperature to give a burner gas of about 12 percent SO_2. Air comes from the same



cipitator for mist removal. (Not often needed.)

Acid leaving absorber (13) at 98 percent is cooled in trombone-type coolers (14), and then is split into product acid, recirculated acid and makeup for the air drying tower (18). Acid in the drying tower circuit (18) is diluted to 93 percent by makeup water and by moisture absorbed from the air. It leaves through trombone coolers (17), part recirculating with 98 percent makeup acid, and part returning to the absorber circuit (13) to supply the water needed to form H_2SO_4 from the SO_3 absorbed.

New Type Contact Process: Except that acid mist formation causes no trouble, and hence there is no drying tower, the new process is largely similar to the conventional in all steps through the waste heat boiler (9). However, the SO_2 content of the gases is higher, about 12 as compared with about 8 percent.

The first big difference is in the quench converter (10) which uses four catalyst stages with cooling between all stages so as to achieve near theoretical conversion, in excess of 99 percent. Cooling is by direct air mixing, without heat exchangers, thus eliminating exchanger cost and maintenance. Quench air quantity is such that the gas composition entering the last stage is the same for both processes.

Because the new absorber (11) operates hot, there is no cooler corresponding to (12) in the conventional process. Converted gas enters a horizontal absorber (11), rather than a tower absorber, and is absorbed in two stages, first in acid of product strength, then in weak acid. Cooling to remove both sensible heat and heat of absorption is accomplished by evaporating water from the acid. Strong acid from the first stage at any desired concentration from 60 deg. Be. to 95 percent flows out through a small product cooler to a product running tank (16) and thence to finished acid storage. Weak acid sprayed into the second stage to absorb remaining SO_2 overflows as makeup for the first stage.

Exit gases from the second stage, containing steam, acid mist, excess air, nitrogen and a trace of SO_2 pass through a Pease-Anthony venturi scrubber (12) and a cyclone (13) to the exit stack (14), leaving with less than 0.1 percent SO_2 and only about 0.5 mg. of sulphur as H_2SO_4 per cu. ft., based on the dry gas. The exit gas plume is virtually all steam.

Cooling water (about 10 percent of that for a conventional plant) first cools the blower gearing (4), then the product acid at (15), overflowing to a water tank (20) where any excess over makeup requirements flows to waste. Makeup water is pumped to weak acid tank (18). The weak acid supplies the scrubber (12) and the makeup spray requirements of the second absorber stage (11). Scrubber acid containing virtually all the mist is collected in cyclone (13) and recirculated to weak acid tank (18).

blower that provides quench air to the converter. The hot gas is cooled to a converter inlet temperature of about 850 deg. F. by passage through a waste-heat boiler of single-pass, fire-tube type, supplied with softened feedwater by steam-driven, reciprocating boiler feed pumps. Temperature of the gas leaving the boiler is controlled by adjusting a bypass around the boiler. Producing 3,000 lb. of 225 psig. steam per hr., the boiler supplies the steam needed by the sulphur melting and sulphur pumping equipment, and feedwater pumps, leaving a surplus for use in an adjacent alum plant.

From the waste-heat boiler the burner gas enters the top of the newly designed four-stage quench-type converter. Here cooling of the reaction gases between stages is accomplished by the direct injection of air. This has two main consequences: First, it eliminates the heat exchanger and SO_3 cooler customarily used, together with their cost and maintenance. Even more important, it makes a larger number of stages feasible and enables conversion efficiency to be pushed up from the customary 96-97 percent, to 99+ percent.

HOW CONVERTER WORKS

Why higher conversion efficiency comes from a greater number of converter stages requires a little explanation. The reaction:

$$\tfrac{1}{2}\,O_2 + SO_2 \rightleftarrows SO_3$$

is exothermic and reversible and its equilibrium is forced toward the left by higher temperatures. However, to attain good reaction rates with reasonable quantities of catalyst, higher temperatures must be used in the earlier reaction stages, with cooling between stages.

At least in theory, perfect conversion could be attained with a large enough number of stages, although the last stages would do little work. However, a practical approach to perfect conversion can be reached in four stages as the diagram, Fig. 1, shows. In the quench converter, going to four stages presents no problems since no heat exchangers are involved. In conventional practice, two stages is the practical limit owing to additional complexity and expense that extra heat exchangers would bring.

The quench converter employs the usual amount of vanadium catalyst per ton of acid produced, arranged in four beds or trays in a single vertical vessel. Air is injected between the beds and mixed by means of baffles with the reaction gases. Thus, in Fig. 1, the slanting lines represent conversion within the catalyst beds, with consequent rise in temperature, while the horizontal dashed lines represent cooling between the beds, without change in conversion percentage. Although a conventional converter will usually have two or more catalyst trays in each converter body, actually these are so arranged only for convenience in maintenance. The group acts only as a single stage because there is no cooling between beds—only between converters. Therefore, the two lowest stages in Fig. 1 are representative of the action of a conventional two-body converter.

Temperatures in the quench converter are measured before and after each catalyst tray and these measurements used in setting the air dampers to give the desired temperatures at each point. After all needed converter temperature control is secured in this way, the oxygen content of the gases entering the last stage is about normal for good conversion in conventional contact processes. This explains why a stronger than usual gas is introduced into the first stage, enabling air to be injected without upsetting the last stage concentration.

Air for converter cooling, and also for burning the sulphur, comes from a motor-operated Elliott centrifugal blower driven through a speed increaser. Air enters through a Dollinger filter and inlet damper which regulates the system pressure. Control of the damper setting is manual, according to the reading of an ammeter on the blower motor. Individual dampers adjust the air to the sulphur burner and to the three injection pipes between the converter stages. Oil for the blower bearings and the speed increaser is cooled by heat exchange with fresh softened water which is later used for product acid cooling and finally as makeup for the acid plant.

WATER SAVINGS

In these days of water shortages, the saving in cooling water effected by the next process step may be the most important new feature of the process in some areas of the country. The SO_3 gases pass directly to the absorber, without being cooled after the last converter stage. The absorber is similar to a Chemico drum type concentrator and operates hot, in two stages. It consists of a horizontal steel drum lined with lead and acidproof brick, and divided into two chambers by a partition. The gas enters the first stage chamber through a Duriron dip pipe and bubbles out beneath the surface of strong acid which is held at finished acid concentration. Unabsorbed gas, together with steam

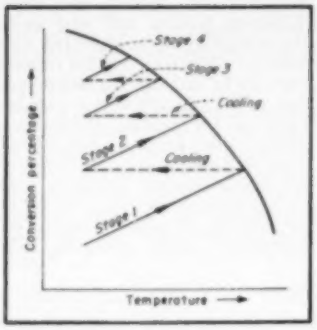


Fig. 1—Diagram explains how multistage converter improves conversion efficiency in the contact process.

produced in the first stage, leaves at the top by a pipe connected to the top of the second stage chamber. Here it contacts a weak acid spray, the source of which will be explained later, then sweeps down over the surface of the weak acid in the bottom of the chamber. As it accumulates, the weak acid in stage (2) overflows to stage (1). The SO_3 dissolves in the acid in both stages, while its sensible heat and the heat of absorption are dissipated without supplementary cooling by evaporating water from and concentrating the acid in both chambers.

Control of the absorption step is maintained by adjusting the concentration of weak acid fed to the second absorber stage and is determined by the temperature of the gases leaving the first stage. Strong acid of the desired final strength overflows from stage (1) by a Duriron pipe, passing through a final acid cooler consisting of a small bank of cast iron D-type coils submerged in a tank of water. This water has previously served to cool the blower gearing and after overflow supplies the plant water makeup. The cooled product acid flows by gravity to a steel acid running tank from which it is pumped by a cast iron centrifugal pump to two 15,000-gal. storage tanks in the adjacent alum plant.

HOW MIST IS REMOVED

Weak acid feed for the second absorber stage comes from the mist collection system which is the last step in the process. The new drum type absorber produces a great deal of acid mist, mixed with excess air, nitrogen, steam and a trace of unconverted SO_2. If it were necessary to avoid mist formation, the new absorber could not be used and the method of cooling by water evaporation would be impos-

sible. Consequently, the device which collects the mist becomes an extremely important part of the entire design. This is a Pease-Anthony venturi type scrubber, lead and brick lined, which discharges into a small lead, steel-supported Buell cyclone collector. The latter has an off-center discharge pipe connected to the lead-lined steel exit stack. Weak acid sprayed into the throat of the venturi agglomerates the mist particles into droplets large enough to collect in the cyclone.

Uncollected tail gases consisting of steam, excess air and nitrogen leave by the stack, taking with them less than 0.1 percent of SO_3 and only about 0.5 mg. of H_2SO_4 per standard cubic foot of dry gas (equivalent to 0.04 lb. sulphur per ton of acid produced). Collected liquid drops to a lead-lined weak-acid running tank and mixes with makeup water. Part of the mixture recirculates to the scrubber, the remainder being pumped by an Olivite pump to the second absorber stage. Thus, the mist returns to the system, and makeup water is introduced both for absorber cooling and for the hydration of SO_3 to H_2SO_4.

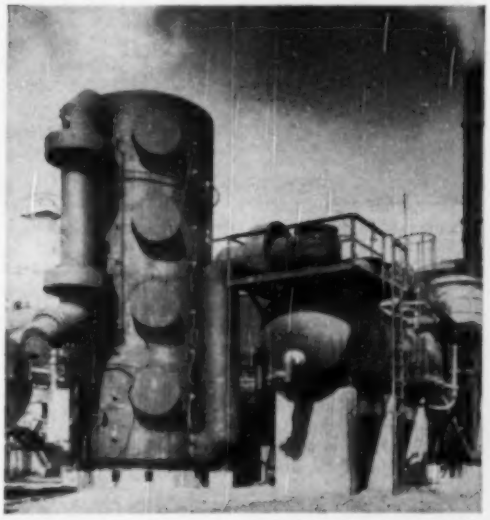
Water from the product acid cooler flows by gravity to a small water tank from which it is pumped through a float-controlled valve into the weak acid tank. Any excess above makeup requirements overflows to waste.

Operation of the plant, including both start-up and shut-down, is exceptionally easy and requires the services of a single operator per shift who also makes the simple tests needed for controlling the process. He has the part-time assistance of a helper to handle sulphur. Main points of control, all of which are manually regulated, include (1) burner gas quantity, composition and temperature; (2) blower air pressure and distribution; (3) converter temperatures at each stage; and (4) the strong acid concentration. The gas composition is inferred by combustion furnace temperature, and checked every 2 hr. by the standard Reich iodine-starch test. Blower pressure is determined by the load on the blower motor and the air distribution regulated occasionally by dampers. Converter temperatures ahead of each stage are recorded automatically, with those following each stage indicated from time to time. Adjustment is by regulation of the quench air supply. Strong acid concentration is inferred from a record of the temperature of the gases leaving the first stage absorber, and is adjusted by regulating the feed of makeup water added to the weak acid running tank.

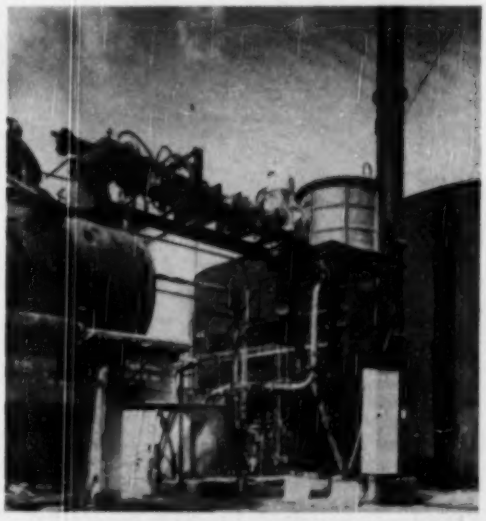
To summarize the advantages of the new process in comparison with conventional contact plants, it eliminates several pieces of equipment and so is less costly to build, physically simpler, and much more compact. It requires from one-half to two-thirds less ground space than a conventional plant of the same capacity, depending on size. Operation is simpler and more foolproof, yet conversion efficiency is higher, in excess of 99 percent, compared with a conventional 96-97 percent. Atmospheric contamination by the tail gases is less, owing to high conversion efficiency and effective mist collection. Cooling water requirements are greatly reduced, by 90 percent or even more during some seasons. Any acid strength from 60 deg. Be. to 95 percent can be produced readily, without extra dilution equipment. Finally simplification has lowered the minimum economic size that can be built and operated, probably making plants of as low as 10 or 15 tons daily capacity feasible for the United States, and even smaller plants abroad.

Set against these advantages, there appears to be one limitation and one relatively minor disadvantage. As we have noted, the process is probably not suitable when 98 percent acid or oleum must be produced. Against its saving in cooling water must be charged a higher power consumption due to the resistance of the tail gas scrubber. This is being reduced, however, as experience permits improvement in the scrubber design, and it seems likely that the eventual blower power needs will prove no more than an offset for the saving in power required by auxiliaries not used in the new process.

The writer is indebted to officials of the Chemical Construction Corp. and to members of the engineering department for assistance with the manuscript; and to American Cyanamid Co. for permission to visit the Hamilton, Ohio, plant.

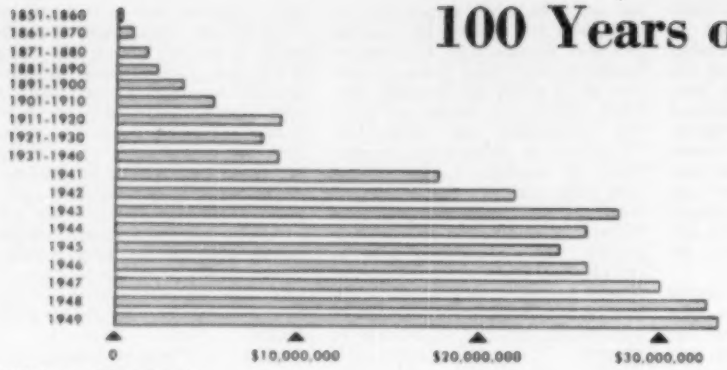


Converter oxidizes 99 plus percent of sulphur dioxide to trioxide, discharging to two-stage drum type absorber.



Absorber removes sulphur trioxide, discharges tail gases through a scrubber and cyclone to exit gas stack.

100 Years of Pennsalt Progress



100 Years of Pennsalt sales.

1850 This was the year the American steel industry (which employed 51 persons) nosed ahead of the slate-pencil business. And this was the year that a young Philadelphia Quaker named George T. Lewis got excited about Dr. Richard Tilghman's patent "for the manufacture of Alcaline Salts of Soda."

So Lewis and four of his friends bought the patent, a piece of land near Pittsburgh–gateway to the West–and formed a company. A Pennsylvania law permitted incorporation to make such things as ". . . iron, paper, lumber or salt . . ." But it made no mention of chemicals. So Lewis incorporated his venture as Pennsylvania Salt Manufacturing Co. Now, 100 years later, salt is still one of its products.

Young Pennsalt started off with a bang. It contracted to drill two salt wells on its land at Natrona, put up 16 buildings for $11,840 and to buy 100 tons of lead at $11,000 for a sulphuric unit. Then Charles Lennig–the only chemist among them–proved that Tilghman's patent wouldn't work!

One day Lewis had an idea. Why not sell lye in little packages so that housewives wouldn't have to leach wood-ashes to make their soap? The company did. It immediately found a market that lasted well into the 20th century (Pennsalt still markets Lewis' Lye for other household purposes).

Lewis' idea set Pennsalt on its feet, endeared the company to generations of American housewives, and made one of the few advances in the art of soapmaking since Cleopatra proved the value of the product.

1872 Natrona was thriving by 1872. It already had a set of wrought-iron tanks–said to be the first in America –and a $14,000 platinum still for making sulphuric acid.

It was one of the first plants in this country to refine petroleum on a commercial scale. By 1861 its refinery could turn out 75 bbl. a day of "first class oil, equal in every respect to the best Kerosene." A shipment of 500 bbl. of "Natrona oil" was probably the first illuminating oil the British ever got from us. But even then the oil business was risky; Pennsalt got out of it in a hurry. One of the company's two chemists–Henry H. Rogers–was so disappointed he quit. He became a Standard Oil millionaire.

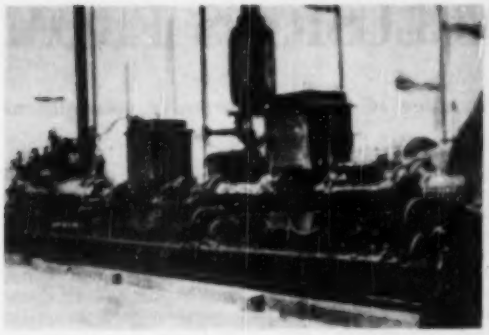
The other chemist–Henry Pemberton–stayed and soon developed a modified Leblanc process. The directors knew Pemberton's worth; they paid him $2,000 a year plus free rent at Natrona. (Today that would be equal to $20,000 or more.) They also paid expenses of moving from Philadelphia.

1900 Pemberton urged Pennsalt to "Go East" and in 1872 to build this plant in Philadelphia. Other than chamber acid, one of its products was refined camphor: it was the celluloid-collar age.

Like all good chemists, Pemberton read every journal he could lay his hands on. He once read about an unique deposit of cryolite at an Eskimo village in Greenland. Then that a Dane named Thomsen could burn cryolite with lime to make caustic soda and alum. Pemberton hurried to Denmark, signed a contract for exclusive American rights to cryolite.

That agreement–still in force after 85 years–was a landmark for Pennsalt. The company became a pioneer producer of caustic and bicarbonate. In 1888 Hall came along with his aluminum process; cryolite has been vital to the aluminum industry ever since.

Then in 1900 a Natrona worker found that cryolite would kill potato bugs. That led to a big insecticide market–one that is still big half a century later.



1902 This Parsons generator was the first steam turbine used by American industry. It was brought from England and set up at Wyandotte in 1902. Its capacity was 230 hp. (Wyandotte's present power plant has a capacity of 62,000 hp.).

Pennsalt engineers, pioneers in electrolytic chemical processes, were always trying out power-generating equipment. People at Wyandotte still remember one big gas engine. Its steady bang-bang-bang was so loud that when it stopped, people for miles around would wake up with a start.

Caustic was then made in the Bell mercury cell. So much of the metal escaped that the plant's sewers were actually "mined" for mercury when they were replaced.

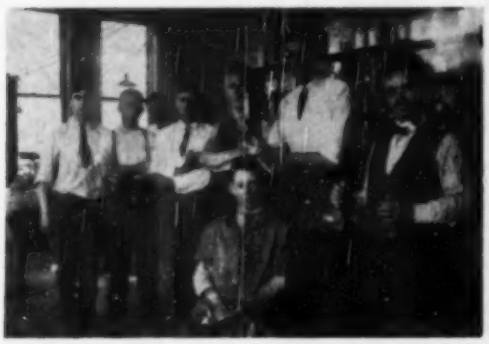
Then in 1904 a young engineer, Arthur E. Gibbs (1874-1950), turned up. He had something he wanted to show President Armstrong. Something important.

1904 Gibbs shows Armstrong a working model of his diaphragm cell. Within two years 300 of these cells had made Pennsalt a leader in the caustic field. (Pennsalt now uses thousands of them.)

When Gibbs got his idea he wondered which alkali producer to offer it to. He picked Pennsalt: "I judged the company by that old Quaker on the trade mark I'd seen in the ads. He looked so honest!"

Caustic sold well, chlorine piled up. Then one day Dr. F. H. Hirschland of the Goldschmidt Detinning Co. passed through Wyandotte on a trolley looking for chlorine. He saw Pennsalt's name on a fence, yanked the cord, went into the plant: "Gentlemen, please, do you have a lot of chlorine you could sell me, please?"

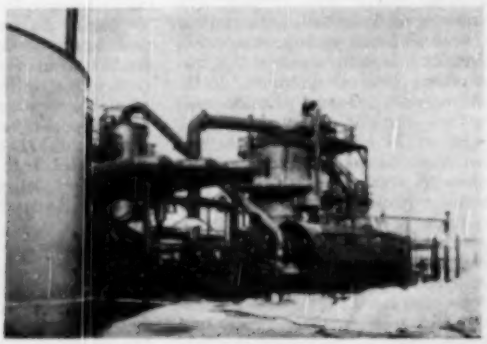
In 1909 the first tank car of liquid chlorine to travel American rails left for Goldschmidt's plant. A new era for chlorine began.



1911 Pennsalt's laboratory crew back in 1911. Although research was stressed since the firm's start (it was Lennig's experiments that proved the Tilghman patent no good) not until 1908 was research and development set up as a separate division. A. E. Gibbs (not shown here) was its director.

Whitemarsh Hall near Philadelphia is now Pennsalt's pride. Rightly so, for the Stotesbury mansion (converted into laboratories in 1943) took four years to build and cost $2,500,000—in 1920 dollars, too. Its 29 baths had gold-plated plumbing; many of its 130 rooms had gold-leaf panels. During World War II valuables from New York's Metropolitan Museum of Art were cached there.

But Pennsalt is prouder still of the ideas that came from its research chemists and engineers during the past century. The company knows full well that its next century will be molded by its researchers.



1950 Pennsalt's plant in Kentucky was built in 1949. Research in fluorine chemistry made it possible. Pennsalt will expand it, too.

In 1852 a firm of soap makers in Cincinnati (by the name of Procter & Gamble) bought some of the first alkali made at Natrona. A century later Pennsalt makes 304 products—at the rate of $38,000,000 a year—in eight plants. They go to practically every industry in America and to practically every free nation in the world.

In 1879 Pennsalt got a new state charter to extend its life until the year 2878! And in 1950 it will pay out its 87th consecutive dividend on common stock—probably a record in the history of American manufacturing.

During the past 100 years Pennsalt has given much to the American way of life—and the American way of life made Pennsalt possible. Here's to the health of both for the next 100 years!

DOW DRAWS CONCLUSIONS FROM

Over 1,700 specimens were exposed to some of the most corrosive atmospheres

OTTO K. SIEPLEIN

The initial announcement of the cooperative paint exposure tests being conducted by Dow Chemical Co. at its huge Freeport, Tex., plant in conjunction with Sherwin-Williams Co. was made in *Chemical Engineering*, May 1947. Now, after more than three years' experience, tests have proceeded far enough to draw definite conclusions.

The outstanding protection is afforded by several systems of which Primer A — Finish M (medium oil butyl-phenolic vehicle) is preferred because of better appearance retention and/or application characteristics than with other systems. Finish N (the medium oil para-phenyl-phenolic counterpart of Finish M) shows early fading, particularly in the blue-green. Oleoresinous coatings show quicker loss of gloss and therefore appearance than does Finish M. Alkyd and chlorinated rubber finishes lose protection more rapidly after the first year than do phenolics and oleoresinous. Primer A is preferred because of faster drying and good performance, although the slow drying Primer H is an excellent substitute.

What they did; how they did it—
A bird's eye view of the program.

The location of the Dow plant directly on the Gulf Coast, southeast of Galveston, is such that sun and weather conditions are always severe. Summers are hot and humid during the day with heavy wetting dews nearly every night. Winter weather results in frequent 100 percent relative humidity—rain, slow drizzles and general dampness that keep exposed surfaces soaked and dripping with corrosive moisture both day and night. Chemical fumes and dusts normally prevailing in plants such as this may contain chlorine, bromine, hydrochloric acid, sodium hydroxide, magnesium chloride, or many organic vapors. The high humidity, the salt-laden air from the Gulf and the chemical atmospheres make for very severe exposure of protective coatings.

Early in their planning for this plant the Dow Chemical Co. realized the psychological effects of color. They selected a very striking color scheme; blue-green for the tanks and lines and vermilion for structural members. Some buildings constructed of combination asbestos on steel are painted light gray and a few with black bituminous paints. With any protective coating, color permanence ranks nearly as high in importance as protection because fading of these chosen shades would quickly give a run-down appearance, and all beneficial psychological effects would be lost. Frequent repainting to maintain such a color scheme or for protection is very costly. Before these tests were started Dow had spent several hundred thousand dollars per year in maintenance painting alone. Usual exterior industrial paints with a normal life of five years had never given protection for more than a few months and even then color had deteriorated badly long before protection was lost.

In an effort to reduce this huge maintenance expense a program of extensive paint testing was undertaken by technicians of Dow and Sherwin-Williams. An enormous amount of preliminary laboratory work was performed before any actual paints were even formulated for exposure. Many pigments were investigated for permanence under varying conditions existing at the Dow plant. Pigments were tested both full strength and mixed, as combinations are usually necessary to produce the colors desired.

Color changes depended on the color and the pigment combinations used, especially in the blue-greens. Three different pigment combinations were used to obtain this color. The blue-green made from titanium dioxide, chrome green and ultramarine blue faded to a dirty, yellowish-blue. In the blue-green made with titanium dioxide, hansa yellow, phthalocyanine blue and toluidine toner, the toluidine and to some extent the hansa yellow faded out and this color became a clean bright blue. This fading took place mostly in the first six months. The most desirable blue-green pigment combinations were titanium dioxide, ferrite and phthalocyanine blue combinations, which showed only a slight darkening. In the vermilion there was no change until chalking became considerable or bad when a slight orange cast appeared. The light grays became slightly lighter as they lost their gloss and lighter yet when chalking began. In the blacks there was practically no color change except in Finishes R & S which grayed slightly.

Many specified pigments of each class were tested to see if pigment manufacturing differences had any effect. Here, by their general trade classification, are some:

Color Retention of Colored Pigments

(Full strength and let down with rutile TiO_2; in pure phenolic-tung oil spar varnish vehicle; films dried 72 hr.)

Pigment	Color Retention In Acid	Color Retention In Alkali
Phthalocyanine blue	Excellent	Excellent
Iron blue	Good	Fades
Ultramarine blue	Fades	Good
Phthalocyanine green	Excellent	Excellent
Naphthol green Y	Sl. browning	Excellent
Chromic oxide	Excellent	Excellent
Chrome green	Poor	Poor
Hansa yellow	Excellent	Excellent
Zinc chromate	Poor	Poor
Chrome yellow	Poor	Poor
Chrome orange	Poor	Poor
Toluidine red	Excellent	Excellent
Fire blazing red	Good	Darkens
Alizarine red lake	Good	Darkens
Indian red	Good	Good
Venetian red	Good	Good
Ferrite	Good	Good
Cadmium sulphides—all shades	Excellent	Excellent

Failure of Mono-Pigmented Films

(In pure phenolic-tung oil spar varnish vehicle; films dried 72 hr.)

Pigment	Failure of Film in Acid	Failure of Film in Alkali
Titanium dioxide—pure	No effect	No effect
Titanium dioxide—Ca base	Def. erosion	Def. erosion
Zinc oxide	Bad erosion	Bad erosion
Basic white lead carbonate	Def. erosion	Def. erosion
Leaded zinc	Def. erosion	Def. erosion
Magnesium silicate	No effect	No effect
Calcium carbonate	Bad erosion	Bad erosion
Red lead	Def. erosion	Def. erosion
Zinc chromate	Def. erosion	Blistered
Lead chromate	Color change	Color change

White inert pigments were tested as these lend certain peculiar properties of durability to paint films. Reactive white and inert pigments such

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THREE-YEAR PAINT STUDY

imaginable. Here are the results — specific conclusions about specific materials.

as zinc oxide and calcium carbonate, while they do not affect the color retention of permanent color pigments, did promote early breakdown of the film by erosion in both acid and alkali. This was true regardless of what vehicle was used for binder. Mixtures of pigments combine the failures of their components.

The vehicle had very little effect on the color retention of the pigment or combination of pigments used unless the vehicle showed extensive whitening under acid or alkali conditions when an apparent fade would appear. Pure phenolics were found best in alkali; modified phenolics were no more than fair. Some alkyds were fair to poor while a very few were much better than modified phenolics tested. Under acid conditions the order was about the same as in alkali but the differences were frequently less marked. The best alkyd was not greatly inferior to the pure phenolic.

Primer formulations proved by previous extensive general use were selected. Chemical reactivity of the pigment was not considered important in the primer as corrosion prevention is the primary object of this film. Early planning of this project brought forth the thought that fast drying primers which permit recoating within a few hours should give improved durability because of a shorter time of exposure of the primer film to chemical dust and fume deposits.

The finish coats were the five colors used at the plant, vermilion, blue-green, light gray, black and white. Each color was specially formulated for this project. Many different types of vehicles, pigments and combinations were used. In the top coats it was felt that too large amounts of reactive pigments would give chance for attack by chemical fumes and dusts; however, because of well known benefits of zinc oxide to durability, especially in coastal regions, this pigment was used in some formulations. Most attention was devoted to the blue-green and vermilion as these are the principal colors used.

EXPOSURE AREAS

Because of the enormous size of this plant and the many different chemical exposures present, eight test areas were selected. In areas where large tanks were available these were used, while at two areas large steel panels were erected. Test surfaces were sand-blasted to remove old paint and rust before the test paints were applied. At two locations additional tests were also painted over old paint already present on the tank surfaces in order to check durability of any system developed over old paint as well as bare steel.

The areas are listed in order of decreasing severity. In subsequent discussion in this report reference will be made to severe and less severe areas. The first four areas listed below are considered severe and the remaining four less severe.

Exposure Rack Area—In this area the paints were applied to sand-blasted metal panels placed at 45 deg. from vertical, facing reference south (30 deg. west of south) and a large open area. These panels are in the vicinity of the hydrochloric acid plant and the magnesium chloride evaporators.

Intake Area—As in the Exposure Rack Area, sand-blasted metal panels set at 45 deg. were used. They face reference south with no obstructions to protect them. These panels are exposed to the fumes from the caustic concentrators which are some distance to the south and to salt water mist carried by the wind from the nearby water channel and Gulf.

Hydrocarbon Area—A sand-blasted section on an 18 ft. diameter metal tank. This exposure faces reference south and it is shaded somewhat by a similar tank about 6 ft. directly in front. Considerable water spray and steam are blown onto the exposure from surface coolers. Small concentrations of chlorine, carbon tetrachloride, and other organic vapors may be more or less continuously present. There are also signs in this area warning of sulphuric acid vapors.

Hydrochloric Acid Area—A sand-blasted section on the side of a 50 ft. diameter metal tank. This area faces reference south and is shaded somewhat by the hydrochloric acid furnaces. The principal fumes in this area are, of course, the hydrochloric acid vapors.

Caustic Area—A sand-blasted section on the side of a 40 ft. diameter metal tank facing reference south. A similar tank about 5 ft. in front of the test tank gives considerable shade to the exposures. Because of this shade and also possibly because this tank is usually warm, this area did not turn out to be as severe as expected. Primers of both Groups I and II were applied to this area. Caustic washing down this tank removed many of the finish coats from some of the test sections. This was more true of the oil type primers and finish coats.

Lime Kiln Area—A sand-blasted section on the side of the oyster shell conveyor facing reference east. This area is subject to fumes (containing $MgCl_2$, steam and HCl) from the magnesium chloride evaporators. These fumes combined with the shell dust deposit a heavy adherent dust even on vertical surfaces.

Magnesium Chloride Evaporator Area—In this area there are two separate exposures. One set is applied over a sand-blasted section on the side of a 70 ft. diameter metal tank and faces reference south. The other set is on an adjacent tank, the only difference being that the paints were applied over the old paint on the tank without sand-blasting. Both of these areas are shaded considerably by the $MgCl_2$ evaporators. Primers of both Group I and II were applied to both the sand-blasted tank and the old paint in this area. This area did not turn out to be as severe as expected because of the shade and also because the fumes from the nearby evaporators did not settle to the ground rapidly enough to collect on these exposures.

Plant B—The seven areas described above are located at Dow Plant A, which is situated 1½ mi. from the Gulf Coast. The eighth area is located in Dow Plant B at Velasco, situated 6 mi. from the Gulf. As nearby units of this plant have not been operating, this area is considered as a weather exposure only. As at the magnesium chloride evaporator area, there are two separate exposures in this area. One set is on a sand-blasted portion of a 100 ft. diameter steel tank and the other set is on an adjacent tank over the old paint. These exposures face due south, and there are no obstructions to shade or protect them.

Actual field application was chosen instead of laboratory preparation of panels. Even though control of surface contamination was impossible in the field, it was felt that practical field

application would give quicker results. All primers were applied in 6-in. horizontal strips one coat and finished with two top coats in 6-in. vertical strips. Careful scheduling of the application of such a large number of materials at so many exposure areas was necessary. All advantage of the faster drying of the quick drying primers would be lost if these were allowed to remain uncoated for longer than their allotted time. Many checks were made to determine speed of painting test strips so as to give a basis for calculation of the application schedule.

It was appreciated that in practical maintenance painting a certain amount of time would necessarily elapse between sand-blasting and application of prime coat. Allowance for this time interval was made in the application schedule.

DUST AND DIRT COLLECTION

The deposits collected on the exposures (almost entirely chemical dusts and fumes from processing equipment such as the kilns, magnesium chloride evaporators, caustic concentrators, etc.) were dependent on the weather and location and not on the type of finish coat. Much of these deposits washed off when it rained. One exception was the lime kiln area where the deposit continued to build up until it was difficult to rub or scrape off. Since there was no difference between the amount of dust on a low sheen top coat and a glossy one, it is quite likely that most of this dust became attached to the paint film during the night or morning when it was wet with dew.

Another common occurrence on the tank exposures was the deposits left by spill-overs and run-downs on the outsides of the tanks. These deposits were usually light colored and were very unsightly, particularly on the black and vermilion, and to a somewhat lesser degree on the blue-green. These deposits did not show so much on the light gray due to its color and they were heavier on the paints which were chalking. The run-downs on the caustic tank were particularly bad because they were strong enough to eat into the surface of many of the finishes.

One phase of the testing program was the effect of surface preparation and treatment or lack thereof in the durability of the coating system used. A large bare steel panel was exposed and allowed to rust as is frequently the practice for loosening of mill scale before painting. Sections were then given various degrees of rust and scale removal, after which various painting systems were applied. Primers A & H were both used with Finish M as top coat. At six months, differences in protection began to show. Over thoroughly sand-blasted metal there was a little to choose in favor of Primer A, but as the metal preparation was less carefully performed, the protection secured from Primer A went down much more rapidly than did the protection secured from Primer H. Primer H showed very little difference in loss of protection over rusted metal compared with the loss over the thoroughly sand-blasted section. These differences have become more pronounced as time has passed. The fast drying synthetic vehicles do not wet metal surfaces as well as the slower drying oleoresinous types and therefore, will not give as good performance when foreign substances are present at the primer-metal interface.

FINISH COATS: Here's how the individual formulations fared in the Dow tests.

In the following paragraphs will be discussed failures of the finish coats tested. Under each heading is listed the vehicle and the pigment or pigments used in each of the four colors exposed blue-green, vermilion, light gray and black. Under each heading is a discussion regarding gloss, chalk and general appearance. Protection is a function of primer and finish coat (see charts). Discussions, unless otherwise stated, refer to the four colors.

FINISH M

VEHICLE
Medium oil butyl-phenolic resin varnish
PIGMENTATION
Blue-Green:—Non-chalking rutile titanium dioxide, phthalocyanine blue and ferrite yellow
Vermilion:—Pure toluidine toner
Light Gray:—Non-chalking rutile titanium dioxide tinted with lamp black
Black:—Carbon black

FINISH N

VEHICLE
Medium oil para-phenolic resin varnish
PIGMENTATION
Same as Finish M

FINISH P

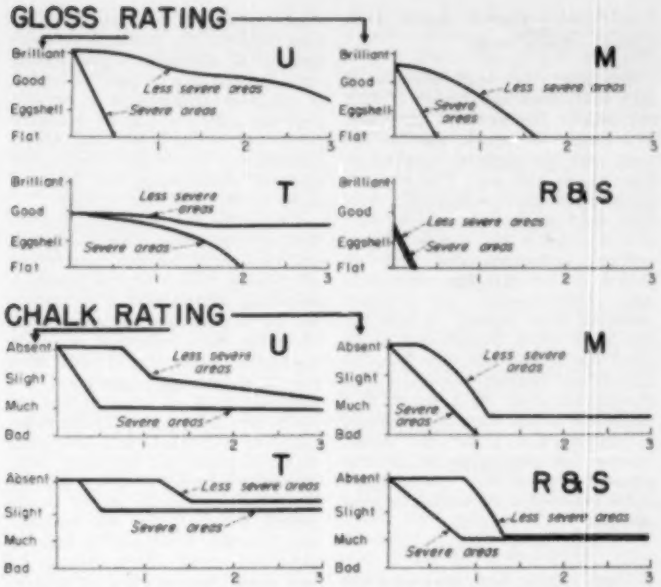
VEHICLE
Long oil butyl-phenolic resin varnish
PIGMENTATION
Same as Finish M

The three phenolics, Finishes M, N & P, will be discussed together because of the similarity between their vehicles and in their behavior on exposure. Finish M has given better protection than any of the other paints in this exposure. Finishes N & P fell just below M and therefore, these three are listed first in the discussion of the behavior of the paints on exposure.

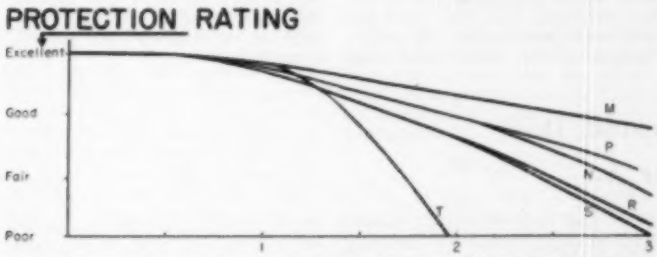
The high initial gloss of these materials fell off quite rapidly in the severe areas to eggshell at the end of three months and flat from six months on. In the less severe areas the gloss was still eggshell to good at the end of 10 months, flat to eggshell at 16 months, and flat at 20 months and thereafter. In this loss of gloss it was noticeable in the severe areas and even more so in the less severe areas that Finish M lost gloss more slowly than the Finishes N & P. The blue-green Finish N showed considerable fading in the first three months while there was none in the other two vehicles. In the severe areas the phenolics were all chalking slightly at three months. The amount of chalk gradually increased until at 10 months and thereafter it was considerable to bad. In the less severe areas the phenolics began chalking slightly sometime between 6 and 10 months, showed considerable to bad chalking from 13 months on. In the black Finish N & P there was a slight graying until chalking became considerable and then this graying disappeared. The phenolics were rated low in order based on their general appearance for about the first year. From the end of the first year until about 16 months they rose in order of general appearance ratings and were at the top after the 16 months readings. During this time (12-16 months) Finish T, which had been at the top based on its good gloss and lack of chalk and the other paints which had more gloss than the phenolics, began to show more rust than the phenolics. In comparing the phenolics as to the amount of rusting, Finish M has always shown slightly less rust than either Finish N or P.

FINISH R

VEHICLE
Long oil oleoresinous type varnish
PIGMENTATION
Blue-Green:—Leaded zinc oxide and non-chalking rutile titanium dioxide tinted with iron oxide and phthalocyanine blue
Vermilion:—Toluidine toner and magnesium silicate
Light Gray:—Leaded zinc and titanium dioxide tinted with lamp black
Black:—Graphite, carbon black and magnesium silicate



Five of the finishes tested and how they stood up during the three year program.



Primer-finish coat systems. Primer B used with Finish T; Primer A with all others.

FINISH S

VEHICLE
Long oil alkyd synthetic varnish
PIGMENTATION
Same as Finish R

Finishes R & S have given protection about like Finishes N & P, just below M. The initial oil gloss of these materials fell off in all areas to flat or eggshell at three months and flat from six months on. In the severe areas they were chalking at three months and increased until at the end of 10 months it was considerable. In the less severe areas they began slight chalking at about 13 months, increasing to considerable at 16 months and thereafter. Finishes R & S never did chalk as much as the phenolics (M, N & P) and the chalking was never as bad as might have been expected from the early loss of gloss. Like the phenolics, Finishes R & S were rated low in general appearance for the first 12 to 16 months. And like the phenolics, they were ranked higher after this time when more rust began to show up in Finishes T & U. Finishes R & S have always shown more rust than the phenolics and also a sort of graying in the black; therefore, the general appearance has not been rated as high. In the caustic area the caustic running down the side of the tank washed off much of both R & S.

FINISH T

VEHICLE
Chlorinated synthetic rubber varnish
PIGMENTATION
Blue-Green:—Non-chalking rutile titanium dioxide, phthalocyanine blue and iron oxide
Vermilion:—Toluidine toner and barium sulphate
Light Gray:—Non-chalking rutile titanium dioxide tinted with lamp black
Black:—Carbon black and barium sulphate

In the severe areas from the first reading three months after exposure to and including the 13 months reading, Finish T ranked ahead of all of the other paints in gloss, absence of chalk, and general appearance. However, by the 16 months reading there was a decided change in Finish T in that rust spots had worked up from underneath and broken through the top coat. As a result, T therefore, had to be rated below the phenolics and Finishes R & S in general appearance because they had much less rust.

In the severe areas Finish T has always ranked ahead of all of the other paints in gloss and in the less severe areas T has maintained its gloss even better; however, for the first 10 months Finishes M, P & U were rated above Finish T because their higher initial gloss did not drop off as rapidly as in the severe areas. In the severe areas Finish T began to show a slight chalk at six months and has been about the same ever since. In the less severe areas slight chalking began about 16 to 20 months and never increased. General appearance of the Finish T has been covered at the beginning of this section; however, one more point in this connection is that when rust did show up it made a very undesirable appearance because of the contrast between the rust and the film which was still glossy. When rust first began to show in the other finishes they were very low in gloss and chalking considerably. There was not as great contrast between the rust and these degraded films as there was in Finish T. Finish T gave excellent protection for a little over a year. After that time it dropped off rapidly and from 16 months on it was near the bottom of the ratings on protection. All of the Finish T films darkened slightly (except, of course, the black).

FINISH U

VEHICLE
Medium oil alkyd synthetic varnish
PIGMENTATION
Blue-Green:—Non-chalking rutile titanium dioxide, phthalocyanine blue and iron oxide
Vermilion:—Toluidine toner
Light Gray:—Non-chalking rutile titanium dioxide tinted with lamp black
Black:—Carbon black

In the severe areas the colors of Finish U were showing slight chalk at three months and had already lost quite a bit of their high initial gloss. At six months in the severe areas they were flat and chalking considerably. In the less severe areas the gloss had degraded to eggshell to good by 13 months. At the same time, they began to show slight chalk. In the severe areas at 10 months and all readings

thereafter there was more rust in Finish U than in Finishes R, S & T and the phenolics. At three years, rust is beginning in the less severe areas.

FINISH V

VEHICLE
Acrylic ester varnish
PIGMENTATION
Same as Finish U

Finish V was very disappointing both from the standpoint of appearance and protection. It was flat in all areas at the end of three months. There never was very much chalking in Finish V, slight being about as much as was ever noticed. However, the top coats did erode away by some means because as early as 10 months large spots were completely void of top coat. These spots were covered with rust. After 13 to 16 months most of Finish V panels appeared as if there had never been any paint on them.

FINISH W

VEHICLE
Modified phenolic resin varnish
PIGMENTATION
Blue-Green:—Three different combinations were used: (1) Titanium dioxide, zinc oxide, chrome green and ultramarine blue; (2) titanium dioxide, zinc oxide, phthalocyanine blue, hansa yellow and toluidine toner; (3) titanium dioxide, phthalocyanine blue and iron oxide.
Vermilion:—Two different combinations were used: (1) Toluidine toner; (2) toluidine toner and chrome orange.
Light Gray:—Titanium dioxide tinted with lamp black.
Black:—Carbon black

Whenever the word phenolic is used throughout this report, it does not include the modified phenolics, W. Finish W vehicle was for the most part the material supplied to Dow during the war. The pigment combinations above, which differ from those used in the other paints were used during the war because of government restrictions and were included in the test for comparison only. Unfortunately, the modified phenolics were exposed in only the two areas which turned out to be much less severe than expected—the magnesium chloride evaporator and the caustic areas. As a result, it is impossible to rate these on protection in comparison with the other paints; however, information on the different pigment combinations was obtained and is included in the section on color changes.

VINYL & STYRENE

Vinyl systems have been tried but without much success. Vinyl copolmer systems if applied directly over steel, require meticulous care of surface preparation and usually work best over sand-blasted metal. In such a location as this, sand-blasted steel shows rusting within a very few minutes; therefore the problems of maintaining an absolutely clean surface until the first coat of paint is applied is extremely difficult. It is possible that this difficulty may be overcome by the use of the newer vinyl primer formulations which have been under constant development and improvement for the past year or two.

During the war the styrene production capacity of this country was built up considerably for the manufacture of synthetic rubber. Styrene has many properties which make it of interest for use in protective coatings. Much effort has been expended by many workers in developing finishes from this abundant and economical raw material. Tests of some styrene vehicles have shown considerable promise, some preliminary tests have given excellent protection for three years, others have broken in a few months. Such different results are to be expected with any new raw material. Much testing is required to find the right and wrong ways to process for best results. Styrene materials in many combinations and methods of processing are being thoroughly tested as fast drying, good adhesion, good weather resistance and good chemical resistance can be obtained when properly formulated.

PRIMERS: Of the 11 tested, Dow found best to be Primer A.

The following primers were designated Group I and were exposed in all areas:

PRIMER A

This primer contains 55 percent red lead in the pigment, the balance being about equal parts zinc chromate, zinc oxide, iron oxide, magnesium silicate, and diatomaceous silica. The liquid is a fast drying synthetic varnish, and the primer will dry for recoat in 6 to 8 hr. Except for Primers F & G, Primer A showed most pull under the brush, especially during the hot portions of the day. This resulted in heavy films which may account partially for its better protection. From a protection standpoint, Primer A stood among the best for the first year, showing no rust except for a very slight spotting. At 16 months this primer showed least rust and at 20 and 24 months it was definitely better than the others. Primer A showed to less advantage in the intake area than in the other severe areas, while in the lime kiln area, Primer B and TT-R-191-A Red Lead (Primer E) showed equal to slightly better. No particular drawback showed up because of any finish coat applied, except with chlorinated rubber enamels. Because of the high aromatic thinner content necessary in these enamels, there is a strong tendency to soften and lift this primer. This weakness was disappointing for the first year because of the very good showing of chlorinated rubber finishes.

PRIMER B

This is a first grade oleoresinous primer that has given outstanding service for a number of years under many different types of exposure. The pigment is composed of red lead, lead chromate, iron oxide, and leaded zinc oxide. The vehicle is a long oil oleoresinous type varnish. Under favorable conditions Primer B can be recoated after overnight drying. Brush application of this primer is very easy. For the first year, there was not much choice between Primer B and Primer A. However, at 16 months, Primer B showed very slightly more rust and has continued to do so. In less severe areas the relative value of these two primers cannot be rated, as insufficient breakdown has occurred to show differences in protection values. Primer B is generally no better for 24 hr. recoating with chlorinated rubber finish coats than is the Primer A. However, some tests have shown safe recoating to be possible under very favorable drying conditions with not too heavy films on smooth metal.

PRIMER C

This is a first grade synthetic primer that has given outstanding service for a number of years under many types of exposures. The pigment is of the same type as Primer B. The vehicle is a synthetic varnish which gives moderately fast dry, overnight recoating being the safest, but under favorable conditions Primer C may be recoated in 8 hr. Brush application was not as easy as with Primer B, but there was no particular criticism from this standpoint. During the first year Primer C

was about equal to Primers A & B, but during the second year it developed rusting slightly faster than did Primer B.

PRIMER D

The pigment of this primer is composed of iron oxide, zinc chromate, zinc oxide, and magnesium silicate in a synthetic vehicle of equal parts alkyd and phenolic resin constituents. Overnight recoat is possible as with Primer C. Brushing on hot metal was slightly poorer than with Primer C. Primer D was equal or slightly behind C in protection value throughout the exposure. There is a little choice in favor of Primer C.

PRIMER E

This primer is Federal Specification Red Lead, TT-R-191-A, which consists of 95 percent red lead in a raw linseed oil vehicle. This was the only primer given 48 hrs. drying before recoating. Except in the caustic area, this primer ranked near the top of the list, being nearly equal to Primer B in vertical exposures but showing more rust on 45 deg. exposures. More differences from area to area were shown by this primer than any other tested. Only in the lime kiln area was this primer entirely acceptable. In the caustic area, red lead was the only primer which showed complete removal of top coats due to tank run-downs caused by splash-overs, drips, condensation, etc. No other primer showed as much failure of this type. This shortcoming definitely removes red lead at least from this area. The slow drying is objectionable for general usage because fast maintenance painting schedules cannot be obtained.

PRIMER F

The pigment of this primer is composed of basic carbonate white lead, magnesium silicate and ferrous ammonium phosphate. The vehicle is composed of synthetic chlorinated rubber plasticized with chlorinated-diphenyl. Four to six hours recoat is possible. Primer F is difficult to evaluate as it is exposed on only one spot in each color section at each area. It probably would fall about with Primer C for protection value. Brushing was very poor but in subsequent work with chlorinated rubber primers and enamels, improvement in this regard has been secured.

PRIMER G

The pigmentation of this primer contains zinc chromate, magnesium silicate and ferrous ammonium phosphate in acrylic ester vehicle with no plasticizer. Four to six hour recoat is possible although brushing was extremely poor. This primer was definitely the worst of those exposed-rust showed in three months and there was complete failure in six months in all areas.

The following primers were designated Group II and were exposed in the magnesium chloride evaporator and caustic areas only:

PRIMER H

This is a first grade material originally developed for priming galvanized iron, and it has been used for many years with very good results for priming structural steel. Brushing is easy and 24-hr. recoat is possible as with Primer B.

PRIMER J

This is a zinc dust-zinc oxide primer used extensively in priming galvanized iron to be finished with all types of finishing coats such as maintenance, sign, and truck finishes. Brushing is easy and 24 hr. recoat advisable.

PRIMER K

The pigment of Primer K contains red lead, iron oxide, leaded zinc, and diatomaceous silica and the vehicle is a modified phenolic varnish. Brushing is rather easy and overnight recoat is possible.

PRIMER L

This is the Navy Specification primer 52-P-18 using a large amount of zinc chromate in the pigment and the vehicle is a combination of phenolic and alkyd constituents. Brushing was comparable to Primer D and overnight recoat is possible.

Unfortunately, these Group II primers were exposed only in two areas not as severe as first expected. The only breakdown of protection at either of these two areas has been the washing of oil type finish coats from Primers H, J & K. Other exposures made at later dates have shown Primer H to be very comparable to the Primers A or B.

Protection performance of characteristic primer-top coat systems are shown in the chart. While Finish N (medium oil para-phenyl phenolic vehicle) is rated third in order, it should be borne in mind that the early fading makes this material unworthy of consideration as a finish coat. The sharp break in the protection of Finish F (chlorinated rubber) is very apparent. Subsequent to this series other tests including both field tests and service experience, have shown the Primer A–Finish M system to give excellent results. In certain portions of the plant where it was previously necessary to repaint every few months, finish life has been prolonged several times.

The good performance of chlorinated rubber for the first year and then the breakdown by rusting, apparently starting below an unbroken finish coat surface, has lead into a search for a primer which would give good performance under this top coat. Such a primer must be sufficiently dry, at least overnight, even in heavy films as occur when brushed over rough, pitted metal, so that the high aromatic solvent content necessary in the formulation of chlorinated rubber finish wrinkling of the primer. Considerable time has been devoted to the development of such a primer and some progress has been made. Primer A does not develop sufficient resistance to aromatic solvents for this use. Large scale field tests however, have shown that under very favorable drying conditions Primer H may be used as a primer with a chlorinated rubber finish coat, provided that sufficient time is allowed for the primer to develop the solvent resistance necessary. Such a schedule is not practical for general painting practice as the time invlved between primer and finish coat is prohibitive because of interference with operations. This system has given excellent protection and appearance over periods very comparable to the Primer A–Finish M system.

Metal surfaces must be protected from chemical plant operating conditions and shut downs for application of this protection are rarely practical. Quick drying is essential so that painting crews will interfere with production as little as possible. Length of service is important from the standpoint of frequency of such interference with operations as well as reduction of the high labor cost of application. Great strides have been made along these lines but there is much left to be done and many theoretical aspects call for investigation. All connected with this project feel that the performance of the Primer A—Finish M system can be surpassed but that as with any research program, the future progress may not be as startling as the past.

The cooperation of the Dow Chemical Co. and many individuals thereof, and the counsel and assistance of numerous co-workers have combined to make for successful prosecution of this project. This cooperation and assistance is appreciated and gratefully acknowledged.

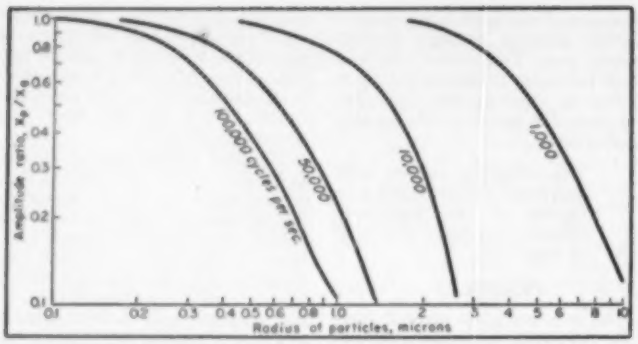


Fig. 1—Plot of Eq. (1) for four different frequencies, showing how particles of various sizes vibrate in a sound field, as expressed by amplitude ratio.

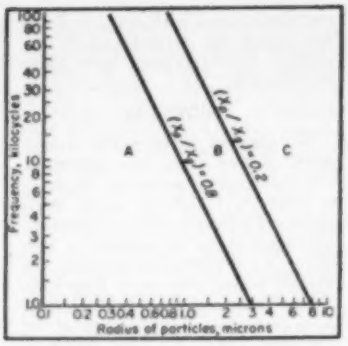


Fig. 2—Transition range of frequencies for isodisperse aerosols.

Sonic Precipitation of Smoke, Fumes and Dust Particles

More and more interest is evident in the sonic precipitation of aerosols. For your better understanding, here is the brief theory, the background, the patent structure, and an estimate of what's ahead.

MELVIN NORD

Atmospheric pollution is becoming more and more important to process industries, and therefore to chemical engineers and chemists.[1,2,3] Not only have industrial activities expanded greatly, but they have tended to concentrate in small areas. Thus, although the atmosphere in the aggregate is a "reservoir" large enough take care of air-borne wastes without appreciable effect, local concentrations often become high enough to be considered public nuisances. With the tendency for legal restrictions to become ever more severe, it appears that many industries will be obliged by law to clean up present sources of atmospheric pollution, and prevent new ones from developing.

Although dusts and fumes can often be collected by comparatively simple means such as filters, centrifugal precipitators or scrubbers, more severe cases require electrostatic precipitation, which is relatively costly.[2] On this account other methods for the collection of fine smokes, dusts and fumes are of much interest and may be expected to become still more essential as industries face the problem of meeting governmental regulations at reasonable cost.

One of the newer methods, still in the experimental stage, is the sonic precipitation of smokes, fumes and dusts. It is not yet clear just how far this process can go, but there is some indication that it may prove less expensive than electrostatic precipitation in certain cases. It is therefore worthwhile to consider the general principles of using sound waves to agglomerate or coagulate aerosols, and to speculate a little regarding the future prospects of the process.

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SONIC PRECIPITATION THEORY

Sonic precipitation acts, apparently through several different effects, by causing collisions between small particles and their adherence to form aggregates of particles large enough to settle out in various ordinary types of collection equipment.

The first consideration in a theoretical examination of how this comes about is the question of the movement of suspended particles in a sound field. Bjerknes[4] and König[5] originally investigated the effect of hydrodynamically alternating sonic fields on spheres suspended in liquids. Brandt, Freund, and Hiedemann have extended the theory to aerosols in sound fields, deriving the following equation:

$$\frac{X_p}{X_g} = \frac{1}{\sqrt{\left(\frac{4\pi^2 r^2 \nu d}{9\eta}\right)^2 + 1}} \qquad (1)$$

where X_p is the particle amplitude, X_g is the gas amplitude, r and d are the radius and density of the particle, respectively, ν is the sound frequency and η is the coefficient of viscosity of the gas. From this equation it can be seen that a suspended particle follows the gas vibration more closely (1) the lower the frequency, (2) the smaller the particle, (3) the lower its density, and (4) the higher the viscosity of the gas. Generally speaking, the first two of these factors are the most important. The product $r^2\nu$ determines the extent to which the particles of a given aerosol will take part in the vibration of the medium. The smaller particles will be vibrating fully, while the larger particles may not be vibrating at all. Fig. 1 represents a plot of the above equation for four different frequencies,[6] and illustrates

the degree of vibration of various sizes of particles under different frequencies. Brandt, Freund, and Hiedemann consider the range 0.2 to 0.8 of values of the amplitude ratio X_p/X_g as a "transition range," as in this range most of the particles of an isodisperse aerosol (i.e., one containing particles of various sizes) will be vibrating, each size at a different speed, so that collisions are likely. If the amplitude ratio exceeds 0.8, the particles all tend to move in phase with each other, so collisions are unlikely, and if the amplitude ratio is less than 0.2, the particles do not take part in the vibration to any great extent, so collisions are again unlikely. Fig. 2 represents a plot of r vs. v at values of X_p/X_g of 0.2 and 0.8, based on the above equation.[29] This chart is divided into three regions, *A* representing the region where particles are essentially in phase with the gaseous medium, *B* representing the transition range, and *C* representing the region where the particles act as "obstacles."

COLLISION MECHANISMS

The fact that particles of different sizes will be vibrating at different velocities is important, because in this way the particles will collide with each other more often than if the particles all partook of the full vibration of the gas, or if they failed to vibrate at all. For a given aerosol, the optimum frequency will presumably be within the transition range of frequencies. It is evident that as smaller particles grow larger by coagulation, they may pass out of the transition range; therefore, aerosols can be expected to flocculate only up to some more or less definite maximum size. This process of coagulation is an "orthokinetic coagulation"; it is caused by collision of particles due to their being affected by an applied field to different extents, depending on their size. It is believed that a considerable part of the coagulation of aerosols in sound fields is due to this orthokinetic effect.

Another factor tending to cause collision of particles may be termed "hydrodynamic."[29,49] Consider two particles in a gas. If the velocity of motion of the gas between the particles is greater than in other parts of the gas, the pressure between the particles is decreased, in accordance with Bernouilli's principle. The particles tend to move together and collide.

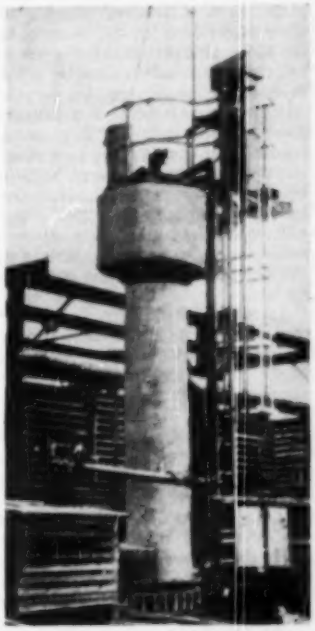
Another effect of sound waves on particles may be caused by the "sound radiation pressure."[49] At high intensities, the sound radiation pressure may amount to several hundred grams, and very surprising results have been discovered. For example, sound radiation pressure can cause a fountain of liquid to rise up in a beaker, can kill bacteria, etc. It has been found that pieces of paper can be supported by radiation pressure in a sounding tube,[35, 49] and that, in a static experiment, if the end of the tube is opened the smoke is quickly blown out through the open end.[49] Tatum[49] placed his sound generator at the bottom of a vertical sounding tube, so that the radiation pressure would keep the flocculated particles from settling to the bottom of the tube. St. Clair has derived an equation for flocculation rate in static sounding tubes caused by radiation pressure.[49] He has shown that radiation pressure tends to cause the accumulation of particles at the antinodes, and causes attractive and repulsive forces between particles.[49]

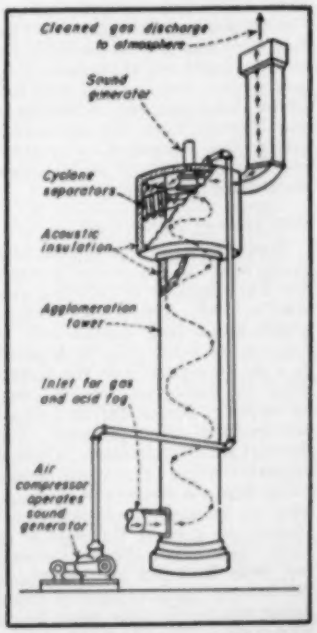
Aside from the theoretical question as to how particles move in a sound field, and what makes them collide, there is the practical question of whether or not they will stick together after they collide. It is well known that smoke particles will stick together upon collision.[49] However, particles which are formed by attrition, i.e., dusts, have much less tendency to stick together when they collide, so that they are more difficult to coagulate. Nevertheless, successful coagulation experiments with sonic waves have been performed on dusts as well as on smokes. It is said that dust particles can be coagulated more easily when they are wet than when they are dry.[49]

The rate of coagulation of a given aerosol is thus seen to depend on the frequency, the size distribution, and the nature of the suspended substance. In addition, the amplitude of vibration is an extremely important factor —in fact it is apparently the critical factor. The larger the amplitude, the more collisions per unit time, and the greater the coagulation rate. Brandt, Freund and Hiedemann have determined the effect of amplitude on flocculation rate and present the following data:[29]

Vibrator Rod Amplitude, Microns	Mass Ratio, m/m_0
0	1
9	2.1
18	4.7
36	13.6
54	200

Here m/m_0 represents the ratio of final average particle mass to initial average particle mass. Each of the above experiments was performed with tobacco smoke, and the time was 5 sec. in each case. The same authors





One of the few commercial installations completed so far for sonic precipitation of an aerosol, this collector built by Ultrasonic Corp. knocks sulphuric acid fog from acid plant tail gases. The drawing identifies the various parts in the photograph.

also measured the mass ratio as a function of exposure time at a constant vibrator rod amplitude of 35 microns, with the following results:

Time, Sec.	m/m_0
1	4
2	13
10	110

Further data of this type have also been obtained by St. Clair.[29] In general, St. Clair's data support the conclusion that the sound intensity is a critical factor in sonic precipitation processes, and also that the rate of flocculation is approximately proportional to the concentration of particles in the air. The latter conclusion follows simply from the fact that more collisions will occur when the particles are closer together. St. Clair[29] also indicates that frequencies of 4,000 to 7,000 cycles per sec. are the optimum for certain aerosols, such as tobacco smoke.

Data of the Ultrasonic Corp.[26] indicate the order of magnitude of the power requirements. An average intensity of 160 decibels was used in these experiments (above 10^{-10} watts/cm.^{2}). This is equivalent to a sound intensity of 2 watt/cm.^{2}, or for a cross-sectional area of 100 in.^{2}, about 0.75 hp. power output from the sound generator.

There is an economic balance between exposure time (hence equipment size) and acoustic intensity (hence power requirement), so that large sizes tend to be economical, due to the reduced cost of operation (i.e., power cost) and the decreased cost of the sound generator. According to the Ultrasonic Corp., the cost of sonic precipitation equipment is considerably less than that of an equivalent electrostatic precipitator.

HOW IT CAME ABOUT

Sonic precipitation of aerosols (dispersed liquid or solid systems in gases) was first suggested by William Ostwald in 1906. The process contemplated would have applied only to fogs, i.e., to liquid droplets dispersed in a gas. It depended on the fluctuations in temperature corresponding to adiabatic fluctuations in pressure set up by a sound generator. The fluctuations in temperature, Ostwald suggested, might cause partial evaporation from one droplet and condensation on another, thus causing large droplets to grow at the expense of small ones. While Ostwald's process has never been put into practice it has had the historical effect of stimulating interest in sonic precipitation of aerosols.

Even before Ostwald's time, there had been some experiments relating to the aggregation of dust particles in air in a sounding tube. These were the famous Kundt experiments.[30] In 1866, Kundt discovered a method for making sound waves "visible." This method consisted in placing some lycopodium powder in a cylindrical tube, passing sound waves through the tube, and adjusting the length of the tube to resonance by means of a movable piston at the end opposite the vibrator. When resonance was obtained, that is, when standing waves were set up, the dust particles accumulated apparently at the nodes. Presumably they accumulated at the nodes because the air was stationary at these points, while it was in violent agitation elsewhere. Thus Kundt's dust figures enabled him to determine the number of nodes in a tube of given length, and hence the wave length and frequency of the sound waves.

Kundt's experiments were not for the purpose of precipitating particles from air, but after Ostwald's suggestion the applicability of Kundt's method to sonic precipitation processes was realized. Since the precipitation process must be able to work with flowing aerosols as well as with stationary aerosols, it was questionable whether Kundt's method would be satisfactory. In a flowing aerosol there is no place where there is complete lack of motion and therefore no place where particles can accumulate. In sonic precipitation the particles must coagulate, that is, increase in size so that they can be separated by gravity or by conventional air filters. In the Kundt tube experiments it is merely necessary for the particles to accumulate (or aggregate) at various points—coagulation is immaterial. Nevertheless, it appeared plausible that if particles could be caused to strike each other due to acoustic vibrations, they might stick together and thus coagulate.

In 1931, Patterson and Cawood[31] reported very briefly on static experiments, performed in 1927, in which MgO smoke was precipitated with supersonic waves of 34,000 cycles per sec. frequency. They noticed an increase in the size of the particles and a precipitation of the smoke at the nodes within a minute. At about the same time, Andrade[4] found that small particles took up the full motion of the gaseous medium while large particles did not, but instead acted as "obstacles." At higher frequencies, the ratio of amplitude of vibration of the particles to that of the air was greatly decreased. At the suggestion of Andrade, Pearson[32] applied the method of Patterson and Cawood to the determination of supersonic wave velocities in gases—the method being quite analogous to Kundt's method, except that Pearson used frequencies of 92,000-802,000 cycles per sec.

FOR SMOKE ABATEMENT

The English scientists—Patterson and Cawood, Andrade, Pearson and others—originally were interested in sonic precipitation for the purpose of studying sonic and supersonic phenomena. Soon, however, they became interested in the practical possibilities of precipitating smoke in chimneys, and so clearing up London's (and other industrial cities') famous "smogs." The smoke abatement problem in England has long been a very serious one. In 1936 the Faraday Society of London met to discuss the possibilities of various methods of precipitating particles from the air. At this time English and German scientists delivered several papers on sonic and supersonic precipitation processes.[4,30,31,33]

Starting in about 1934, a group of German scientists had become interested in sonic precipitation. Brandt and Freund[34,35] had shown that tobacco smoke was precipitated almost instantaneously by sound waves of high frequency (several thousand cycles per sec.). Their investigations also indicated that all true aerosols could be coagulated in this way. Further theoretical and experimental work by Brandt, Freund and Hiedemann[1,6,10,12-14] developed some of the principles of the process. They performed experiments on flowing aerosols for the first time, as well as on aerosols in closed tubes. According to Brandt, Freund and Hiedemann, 200 liters per min. (or about 84 cfm.) of sal ammoniac smoke or tobacco smoke could be cleared up in laboratory-size equipment at frequencies of 5,000 to 50,000 cycles per sec. A calculation of exposure time from the figures on the size of their equipment leads to a value of about 0.5 sec.

In 1938 Gies,[36] a German scientist, attempted to devise a practical method of using sonic precipitation for coagulating smoke. He used several different types of sound generators, but concluded that none were satisfactory for commercial use because of the high power requirement and the low sound intensity available with them. He found that the power requirement for a laboratory supersonic whistle was about 600 times that of a commercial electrostatic precipitator and that the power requirement for a magnetostriction device was about 50 times that of a commercial electrostatic precipitator doing an

equivalent job. He also found that, due to the low acoustic intensities available with his sound generators, the velocity of air flow had to be quite low in order to obtain satisfactory precipitation efficiencies. He therefore concluded that a new type of sound generation process would have to be developed before the process could be used commercially.

About this time, the United States Bureau of Mines also became interested in the possibilities of precipitating smelter smoke and in other applications, such as those where electric precipitating units could not be used on account of fire hazard. A series of papers was published[10,11,12,13] between 1937 and 1941, describing theoretical and experimental investigations which culminated in the design of an electromagnetic sound generator and control equipment, and in the erection of a fairly large laboratory unit for the flocculation of aerosols.

Sonic precipitation methods are reviewed in Refs. 1, 17, 26, 40, 44 and 45.

PATENTS IN THE ART

The earliest patent on a sonic "dispersal" unit was taken out by Amy in 1934.[2] It concerns itself primarily with "fog, and perhaps particles of other substances also, and especially to increasing the visibility in the atmosphere." His first claim is quite general, i.e., "(1) The method of dispersing foreign particles, which consists in producing and for a time maintaining waves in and of the particle-laden atmosphere of more than substantially 5,000 and less than 100,000 cycles per sec. and of adequate energy to materially speed dispersion."

The second series of patents was taken out by the German scientists, Brandt and Freund,[10-15] between 1936 and 1939. These patents appear to cover the basic fundamentals of the process for sonic precipitation of aerosols, for example: "(1) A process for separating suspended particles (aerosols) from gaseous or vaporous media by means of sound vibrations preferably of short wave length in which standing waves are produced in a separating chamber which receives the medium loaded with the suspended particles, by tuning to resonance with the impressed waves. (2) A process according to claim 1 or 2 in which the medium is led in a continuous current through the separating chamber". . . ."

Finally, in 1940, St. Clair[42] obtained a U. S. patent. His patent covers a method for reducing the power requirements in a sonic flocculator. He uses a cylindrical tube with an inlet near one and an outlet near the other end. The tube is set into resonant vibration in the usual way. The reduction in power is occasioned by locating the entrance and exit holes at nodes. Using ⅛-in. holes around the perimeter of the tube, and locating them at nodes rather than at antinodes, reduces the power loss through the openings in the tube by a factor of 100, according to St. Clair. The reason is that the sound energy escaping is proportional to the square of the pressure amplitude, and this is a minimum at the nodes. This patent has been assigned to "the Government of the United States as represented by the Secretary of the Interior."

SONIC PRECIPITATION FUTURE

The two principal workers in this field at the present time are the U. S. Bureau of Mines and the Ultrasonic Corp. of Cambridge, Mass. The Bureau of Mines has concentrated its efforts on theoretical and experimental laboratory investigations of sonic precipitation of aerosols. The Ultrasonic Corp. has concentrated on the study of sonic precipitation of aerosols on both a pilot-plant and commercial scale. The sound generator used by this company is essentially a high-speed gas siren driven by a gas turbine. Recently the company has reported the commercial installation of a sulphuric acid fog collector and also a sonic precipitator for collection of soda ash fumes.[46]

On the basis of all the information now available, it seems reasonable to believe that any desired precipitation efficiency can be obtained with the sonic precipitation process by sufficiently increasing the power input (*i.e.*, sound intensity). In addition, the data indicate that exposure times can be sufficiently reduced to give reasonable equipment sizes by increasing the power input. It seems reasonable to expect that exposure times of the order of magnitude of 0.5 sec. may be obtainable in practice.

With the sound generators available at present,[47] exposure times of 4 sec. are required, and agglomeration of the particles is sufficiently great that 90 percent by weight of the particles is removed. There is apparently no lower limit to the particle size which can be agglomerated by this method. Particles too fine for cyclone separators are easily agglomerated by sonic means and are then recovered by a cyclone separator.

It therefore appears likely that this process will prove of increasing utility in solving atmospheric pollution problems within the next few years.

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Editorial Viewpoints

A Tax on Research and Productivity

Few realize it but an excess profits tax such as now proposed by Senator O'Mahoney could heavily penalize companies that have been most aggressive in research and product development. It could also put a premium on inefficiency by increasing the tax burden on firms that have invested heavily in modernizing their plant and equipment. This seems so contrary to the popular conception of this wartime measure that we asked the McGraw-Hill Department of Economics to explain it—and in language even chemical engineering editors can understand. Here is what they told us:

One of the two optional bases for computing the proposed tax is to set up a so-called normal base period—say, 1947-9 and tax away almost all of the profits earned in excess of the average of this base period. For some companies profits during these three years might average out fairly well. For others, especially in faster growing industries such as ours, this freezing of profit relationships is unrealistic. Companies which had the least growth in earnings would have the highest exemption and pay the lowest taxes. Yet they might be the very companies to benefit most from war production. For example, some distilling companies which made very high profits in the base period might now be almost exempt from EPT. On the other hand, certain chemical companies would suffer tremendously even though their war business may not be particularly lucrative. This is simply because they earned less in the base period but invested heavily in research and engineering know-how.

Using the second optional method, viz, a certain percentage on invested capital, we find this anomaly: Two companies may be identical in every respect except the date at which they acquired their plant and equipment. But they would pay different taxes. The company which invested when equipment costs were high has a big invested capital base and a low tax. The company which invested at a low price level (usually considered smart business) gets stuck. Its profits will almost surely yield a high percentage return on the small capital base.

Remember, too, that only such assets as plant equipment and working funds are included by the government accountants in invested capital. So the railroads with most of their money in tracks and rolling stock, have a generous exemption from EPT. But a chemical or drug company gets no credit for substantial sums invested in research, engineering know-how, product development and promotion.

Perhaps the greatest weakness of all is that an excess profit tax naturally brings inefficiency with it. In the short run there is little incentive for a company to hold down its costs if the savings are to go to the government. Plants can get along with obsolete processes and older equipment, can hoard labor and materials without worrying too much about their costs. And this is coming at a time when the public interest demands a sharp increase in industry's productivity.

Summing this up, here are our economists' conclusions and advice, in their own words:

"It is too early to calculate the damage that an excess profits tax might do in slowing down American industry's progress. But clearly an all-out tax in a period of limited mobilization may well result in industry's letting its plants and equipment run down. The cost to the country of that neglect would be far more than an excess profits tax would bring in.

"The question is whether Congress will consider the plant and equipment needs of all industry—not just those companies with war orders—before writing a provision for rapid amortization into a new excess profits tax. Perhaps Congress can take the curse off the tax by coupling it with special allowances for companies that reinvest their earnings in research and development as well as in new plant and equipment.

"It would probably help a lot if business men started bombarding Congress with ideas on this subject. Some of your own readers may have ideas on how to make the excess profits tax work better. There are few tougher problems, and few which can mean more to business—and to the nation's future."

Voluntary vs Formal Allocations

Scarcity of alcohol, benzene, chlorine, and related or alternate chemicals has already led to instigation of control measures under Washington mandate. Perhaps by the time this issue reaches its readers additional allocations will have been put into effect.

Voluntary techniques were used at first. But behind each is an obvious pressure which almost compels adherence to the recommended programs. A major initial difficulty, which was also conspicuous from 1942 to 1945, is the threat of anti-trust action when these arrangements involve inter-company agreements. Smart executives from industry are, therefore, demanding formal clearances from the government in all cases where later flashbacks from some over-zealous worker in the Department of Justice might be expected.

Remaining unsolved is the problem of disciplining

the small minority that often seeks large immediate gain without regard to the ultimate effect on the allocation program. One or two such individuals could force the imposition of burdensome rules and the complete ritual of record-keeping and formal controls.

Responsible industrial leaders would like to see the voluntary programs continued as long as possible. They will do all they can to prevent chiseling and profiteering. Ultimately the new National Production Authority must call the turn.

Industry, Too, Needs Manpower

President Truman has stated that an early increase of uniformed personnel to about three million men is expected. At any moment that number may again be doubled should the Korean situation lead indirectly to urgent need for large forces in Europe, the Middle East, or elsewhere. These are serious problems but so, too, are those that industry must face.

Plans must now be made to prepare the reserves of industrial personnel to take care of the expanding needs of the war program. Fortunately the personnel officers of most companies remember clearly how they hired handicapped persons, put women on men's jobs recalled retired persons, and adopted a dozen other expedients. Readiness for all such moves is once again necessary.

In-plant training programs will have to be reactivated and accelerated. The upgrading of substitutes should be done in advance, rather than by the costly method of later trial and serious error. Training for multiple skills to give flexibility in staff assignments is also important.

And all these problems will become more urgent as we lose valuable manpower to the draft and to calls for duty by older men in the military reserves.

Butadiene, Industrial Chemical

Looking into the distant future we are reminded that one of the next big developments in the field of organic chemicals for industry is likely to be based on products made from butadiene. That chemical is now available in huge tonnages in extremely pure form and at low factory cost. It is the first chemical to be made in these quantities in a pure form by the petroleum industry. It is the only diene which has ever been made so pure on a large scale.

When we consider it as the basis of a new family of chemical products, we are thinking of both the immediate and the more distant future. Present supplies must go largely for rubber copolymers or to make polybutadiene to be used as a plastic and in many applications like the other elastomers. Current shortages compel the restriction of butadiene on a large scale to this type of usage. But that is only a first step.

Almost all of the dienes cost a dollar and a half, or several times that, per pound. Yet butadiene can be made in government plants for only about 8 to 10 cents per pound under the government bookkeeping. That means that there is charged against the product, raw material cost, labor and other expense, physical maintenance of the plant, a small interest to reimburse the U. S. Treasury, and a small overhead item. There is no provision for the other capital charges, such as obsolescence and retirement of the investment. But even including these items, the gross plant cost would not be over 15 to 18 cents in these huge government works.

Butadiene is highly reactive. It will lend itself to the synthesis of many derivatives. When it can be supplied for other than rubber and plastics, it is likely to become a competitor of many other starting materials and the basis of many new chemical products. The petroleum industry can make very large quantities and will do so as the demand grows. Even more likely is an integrated system for converting ethylene through alcohol into butadiene by typical chemical methods. The processor of hydrocarbons has the choice between the cracking route and the alcohol route, with the prospect that both will be used to a considerable extent.

Under the emergency program recently authorized by Rubber Reserve, the cost of butadiene made at Kobuta and Louisville from fermentation alcohol will be high. The figure will depend on the system of bookkeeping which the government decides to use. Actual cost to the taxpayer would be very low if the alcohol were all made from waste potatoes and stored surplus grain (either wheat or corn) which is now depreciating in quality because of rat and insect infestation.

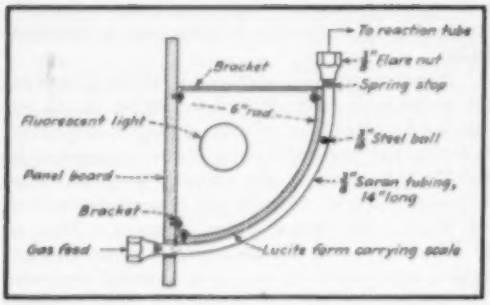
It is premature to guess what the future price of butadiene will be. But is is perfectly certain that it can be made in non-emergency periods and sold profitably at prices which will make it an attractive starting material. Any company interested in future developments in the organic field, will make a great mistake if it does not explore the possibility of using butadiene processes and products which fit into its production program.

All For One, One For All

There are two Charles E. Wilsons in the headlines. The GE and the GM chief executives are serving respectively as national chairman and vice chairman of the Community Chests of America. By so doing they set a worthy example for business and professional men all over the country who are pooling their efforts and resources in support of some 14,000 "Red Feather" services for local community health and welfare programs. It is sound business to unite these many fund-raising campaigns under one efficient national organization. It is also sound business for each of us to join with our friends and neighbors in making sure that the Red Feather program is equally efficient and successful in our local communities.

The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



Simplified Visual Flowmeter For Corrosive Gases

FREDERICK J. GRADISHAR, *Jackson Laboratory*
E. I. du Pont de Nemours & Co., Wilmington, Del.
★August Contest Prize Winner

Accurate control of process conditions in units requiring visual indication of gas flow rates becomes difficult where glass rotameters cannot be used. Such a case is in handling materials containing hydrogen fluoride. A flowmeter applicable to HF metering, yet having most of the advantages of the glass rotameter, is illustrated above. It is versatile, easy to read, simple to install, and gives low pressure loss.

The flowmeter proper consists of a length of Saran tubing containing a ball whose diameter is somewhat less than the inside diameter of the tubing. The Saran tube is mounted on a sheet of Lucite, preformed as a quadrant of a cylinder, upon which an arbitrary scale is etched. Suitable line adapters, float stops and means for illumination are provided.

In operation the gas flow is indicated by the position of the ball in the Saran tube relative to the lower neutral point. A uniform scale calibration can be obtained by an appropriate curvature of the Saran tube, but the convenient circular form provides a satisfactory calibration for most purposes. Any capacity rating, accuracy or flow range can be obtained, merely by the selection of the proper tube size, tube length, or the diameter and density of the indicator spheres.

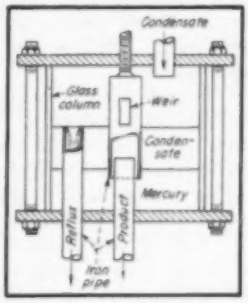
A multiple unit serving a set of parallel reaction tubes was fabricated in our plant shops at a very modest cost. The device has been in use for over a year and has given satisfactory service with a minimum of maintenance throughout that time.

Jackson Laboratory contribution No. 90.

Flow Splitter For Lab Size Fractionating Columns

WALTER S. KIRK and JOSEPH L. VIOLA, JR., *Respectively, Technical Representative, Behr-Manning Co., Troy, N. Y., and Chemical Engineer, New York, N. Y.*

A flow splitter employing a mercury seal as shown in the accompanying diagram was designed for and used during the past spring on a 4-in. diameter, ten-plate bubble-cap column in the Pratt Institute Chemical Engineering Laboratory. Splitters on the market are generally designed for capacities greater than those encountered in small laboratory installations.



The body of the device consists of a 3½-in. section cut from a 3½-in. diameter glass column. A gasket is employed between the glass and the top plate. Either another gasket or a commercially available porcelain cement can be used to seal the glass to the bottom plate. Three tie rods hold the plates in position. Iron pipe risers are used to eliminate amalgamation. All permanent connections were welded.

★ SEPTEMBER PRIZE WINNER—A $50 prize will be issued to . . .

JOHN W. POSTLER

Chemical Engineer, Cincinnati, Ohio

. . . for an article describing a method of electromagnetic driving of agitators which eliminates the use of a shaft passing through the vessel wall and so permits complete sealing of the vessel. Winner of our September contest, this article will appear in the November issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the October winner will be announced in November and his article published in December. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

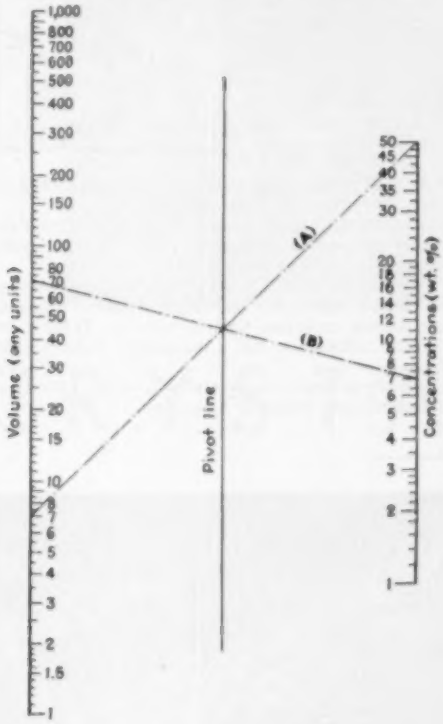
HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data, as well as new cost-cutting ideas are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

Any desired reflux ratio can be obtained by adjusting the vertical position of the weir in the condensate. Vertical position is changed by means of the threaded rod. If total reflux is desired, the weir is raised free of the liquid level.

If desired, the splitter can be calibrated by the height of the threaded rod above the top plate.

Contributed while the authors were senior chemical engineering students at Pratt Institute, Brooklyn, N. Y.



Dilution Nomograph for Certain Aqueous Inorganic Solutions

W. C. Frishe, L. S. Ansell and H. Samuels
Chemical Engineering Dept., Clarkson College of Technology, Potsdam, N. Y.

It is often desired to make up aqueous solutions of compounds from more concentrated solutions. When a dilute solution of definite volume and concentration is needed, it is necessary to calculate the initial volume of the concentrated solution. If a definite volume of the concentrated solution is to be used, it may be necessary to find the final volume of the dilute solution or the concentration of a diluted solution of a definite volume. This entails the looking up of values of densities, conversions of volumes to weights, and the setting up of material balances; if the unknown is a concentration, a trial-and-error solution is necessary. These calculations and conversions are facilitated by the use of the nomograph above, from which any of the above unknowns can be easily found when three of the four variables are known.

A material balance of the solute shows that:

$$V_1 d_1 C_1 = V_2 d_2 C_2 \quad (1)$$

$$\log V_1 = \log V_2 + \log d_2 C_2 - \log d_1 C_1 \quad (2)$$

$$\log V_1 = \log V_2 + \log f(C_2) - \log f(C_1) \quad (3)$$

where V_1 and V_2, d_1 and d_2, C_1 and C_2 are the initial and final volumes, densities, and concentrations by weight, respectively. It was found that there are seven inorganic compounds which have very similar density-concentration curves. These compounds are:

Sodium hydroxide	Potassium carbonate
Potassium hydroxide	Aluminum chloride
Potassium chromate	Sodium carbonate

Calcium chloride

The average values of the product of the density and concentration at different concentrations were computed for these compounds and these values were used as $f(C)$ in Eq. (3) to construct the nomograph by methods outlined by Davis.[1]

The volumes are in the same ratio. Therefore, any unit of volume can be used provided they are consistent for the initial and final volume. This nomograph is based on 20/4 deg. C. data[2] and complete mixing is assumed. No appreciable errors appear within the range 0 to 30 deg. C. provided the initial and final temperatures are the same.

As an example of use of the nomograph: Dilute 7 gal. of 50 percent by weight of the compound to 7 percent by weight. What is the final volume of the solution? Connect the volume of the initial solution with its concentration by line A. With line *B* connect the final concentration with the intersection of the pivot line and line A and continue this line until it intersects the volume axis. This is the final volume or 72 gal.

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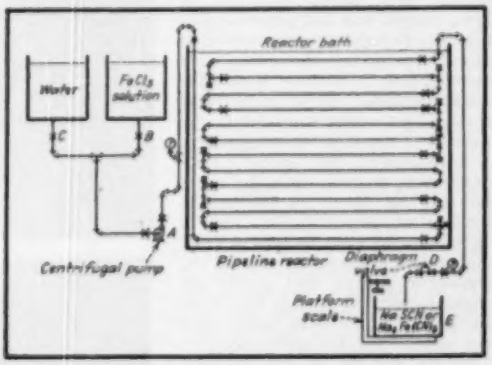


Simple Way to Determine Volume Of a Pipeline Reactor

Anthony P. Massa, *Thiokol Corp., Trenton, N. J.*

This method is used to determine the volume of extensive or complicated pipeline reactor equipment where a volume calculation from physical dimensions would either be time-consuming or inaccurate.

As shown in the accompanying sketch, two tanks—one containing water and the other containing a 10 percent

ferric chloride solution—are used for the determination of the holdup time and the exact volume of the pipeline.

The centrifugal pump *A* is turned on with valve *B* shut and valve *C* open. The diaphragm valve *D* is adjusted so that only a slight pressure is on the system. Tank *E* is set on a scale so that the effluent from the pipeline reactor is measured continuously.

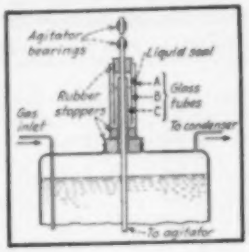
When the system has been in steady operation for several minutes, valve *B* is opened and valve *C* shut simultaneously so that for several minutes the 10 percent ferric chloride solution is allowed to flow through the pipeline. At the same instant the time is noted, and the weight of tank *E* and its contents observed. Immediately, enough sodium thiocyanate or sodium ferrocyanide is put into the tank contents to make an approximate 5 percent solution. Although this solution may be diluted considerably by the pipeline effluent, the test is sensitive enough so that the accuracy is good.

After several minutes valve *C* is opened again and valve B shut so that the system is operating in the same manner as previously. Careful observation meanwhile is exercised at tank *E* so that as soon as a red or blue coloration (depending upon whether sodium thiocyanate or sodium ferrocyanide was used) is seen, the weight of the tank contents is read and the time observed.

The increase in weight of the tank contents is equivalent to the volume of water contained in the pipeline. Depending on the capacity of the pump used, this method may also be used to determine the holdup time in the pipeline reactor, or both holdup and the velocity of the liquid through the system.

Liquid Seal for Agitators Holds Corrosive Gases

DANIEL T. HAYDEN, *Sociedad Agricola Paramonga Ltda., Supe, Peru, S. A.*



In laboratory or pilot plant operations it is frequently necessary to react a corrosive gas with a liquid, and at the same time agitate the solution in order to insure sufficient reaction. An example would be the chlorination of liquid hydrocarbons.

The accompanying sketch shows a simple, positive liquid seal which, within small pressure limits, prevents the escape of gases. It does not interfere with the agitator drive.

Glass tubes *A*, *B* and *C* are of sufficiently different diameter that the agitator, and with it tube *B*, can revolve easily without touching tubes *A* or *C*.

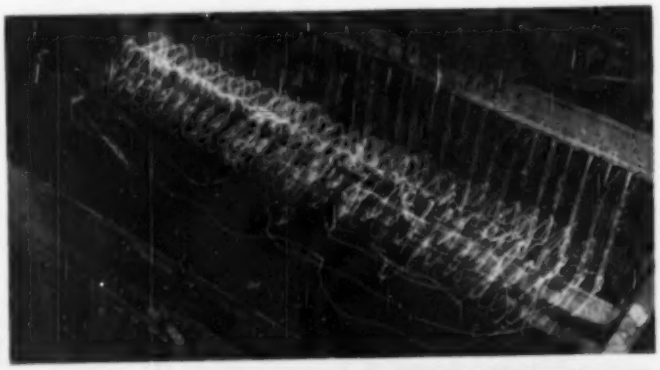
The outer seal tube *A* is filled with water, mercury, or other suitable liquid, and the height regulated according to the pressure requirements of the reaction. Tubes *A* and *C* may be calibrated to give a manometer reading if this is desired.

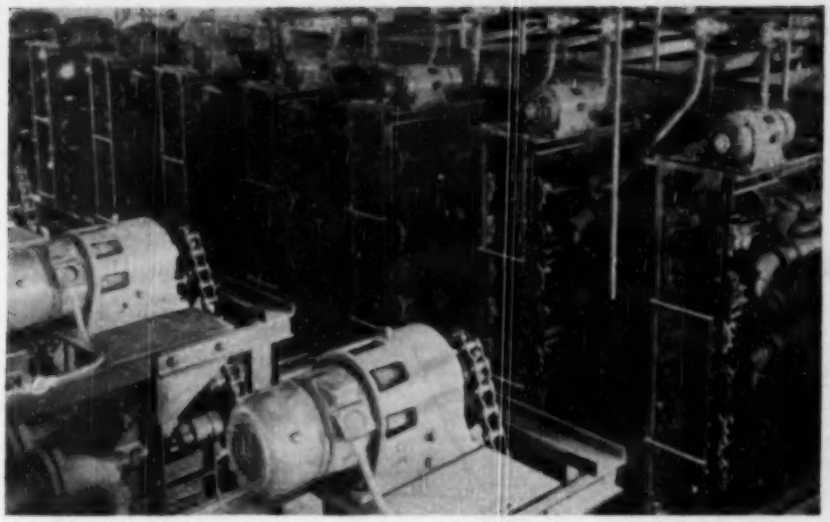
Obviously this seal is easily applicable to pilot plant and also to small-scale industrial operations.

Light Pattern Shows Waste Motion— Suggests the Cure

Du Pont's efficiency engineers have recently been using a tiny spot of light, coupled with long-exposure photographs, to uncover waste motion in manual operations. According to a recent article in *Business Week*, the simple technique consists in fastening a tiny, light-weight flashlight to the wrist of the worker whose operation is to be studied, then taking a long-exposure photograph while the operator goes on about his business as usual. Each picture shows a trace of light recording every movement made during the operation. By study of the crazy-quilt pattern that results the engineers may immediately find a better procedure, although more often the pattern provides only a clue.

Shown here are two such pictures, the upper before, and the lower after the better procedure was worked out. The half-hour operation of cleaning a pigment filter at the Edge Moor, Del., plant was cut to a few minutes. Originally the 31-leaf filter was cleaned of the heavy paste-like pigment by laborious scraping with a wooden paddle. Now compressed air removes the pigment (bottom) with little effort on the part of the worker.





CRYSTALLIZERS

Crystals have greater sales appeal and can be shipped easier and cheaper than solutions. But they must be formed in a crystallizer selected for the job at hand. Theory plays a part in the design and choice of these units but many rules of many thumbs must be brought to bear on any crystallization problem.

A. RALPH THOMPSON

CHEMICAL ENGINEERING REPORT—OCTOBER 1950

CRYSTALLIZATION is usually defined as the precipitation of solid material from solution. In some cases, because the types of equipment which may be used are similar, this definition may be extended to include the solidification of a liquid.

Texts don't cover

Industrially, crystallization is much more important than would be indicated by the amount of space devoted to it in the current literature or in textbooks. But it would be difficult to name an industry in which solids in crystalline form are not either produced or at least used at some stage in the operations.

The phenomenon of a salt coming out of solution is especially complex because it involves diffusion, formation of nuclei and crystal growth, all of which may take place simultaneously. At present, it is not possible to calculate the rates of any of these exactly and so crystallizer design remains empirical. Many different types of crystallizers are produced to meet the various demands. And the fact that some consumers insist, often without good reason, on crystals of a given shape, size and uniformity, as well as purity, has not lessened the designers' difficulties. The complexity of the process has discouraged academic research. Hence, most of the work, publications and theories on crystallization have been put forth by equipment manufacturers and then usually to prove the adequacies of their own particular lines of equipment.

Super-saturation necessary

Since supersaturation is the important prerequisite of crystallization crystallizers can be conveniently classified according to the primary

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methods by which supersaturation is brought about or released:

Five ways to crystals

1. Supersaturation by cooling.
2. Supersaturation by evaporation of solvent.
3. Supersaturation by adiabatic evaporation (cooling plus evaporation by vacuum).
4. Circulation of solution over crystal bed to release supersaturation produced by one of the above methods.
5. Salting out.

Solubility picks method

Cooling is the most satisfactory method of producing the necessary supersaturation in the case of materials that show a rapid increase in solubility with temperature (e.g., potassium nitrate). Evaporation can be used successfully for materials that exhibit little change in solubility with temperature (e.g., sodium chloride). Adiabatic evaporation is employed most effectively for substances with an intermediate type of solubility curve (e.g., potassium chloride or carbonate). In order to make a decision con-

How Theory Aids in the Design and Choice of Crystallizers

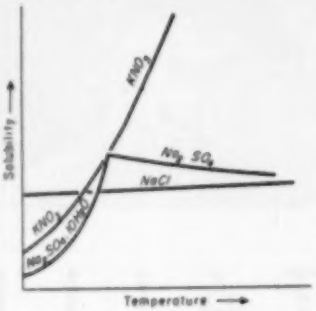
Before crystals may be obtained from solution it is necessary that a supersaturated solution be formed. This means that, to some degree, the solution must contain more solute than the equilibrium saturation value for the given conditions of temperature, pressure and composition. The necessary supersaturation may be produced fundamentally in three ways: (1) by changing the temperature (usually cooling the solution) so that the solute is less soluble, (2) by evaporating solvent, (3) by adding another component so as to produce a resultant solution in which the solute under consideration is less soluble.

Combinations of these methods may be used advantageously in many cases. But the method to be employed in the case of a particular salt depends upon the nature of the salt's solubility curve with respect to the solvent involved, which is usually water. In the accompanying diagram, for instance, it can be seen that the solubility of potassium nitrate increases very rapidly with the temperature. For salts of this type, cooling is an entirely satisfactory means of producing the required supersaturation. In the case of sodium chloride, however, the solubility increases only very slightly with temperature and its type of curve suggests that evaporation would be a more economical way of exceeding the saturation concentration.

The line for sodium sulphate shows the characteristic break when there is a change in the solid phase which is in equilibrium with the solvent. This salt also shows a phenomenon which is exhibited by only a few materials. Above the transition point, of 32.3 deg. C., the salt becomes less soluble as the temperature is increased. This results in what is commonly referred to as an "inverted" solubility curve. Salts of this nature offer considerable difficulty if heat is employed because the salt tends to come out of solution and deposit at the hottest points in the equipment unit, the heat transfer surfaces.

If crystallization is to be carried out by taking advantage of the salting-out principle, it is necessary to have data for the complete system over a wide temperature range and over the entire composition range.

In spite of the fact that, for most purposes, fine crystals would be much more satisfactory because they can be dissolved more quickly, some consumers



still demand large well-formed crystals. This is also counter to the evidence which shows that large crystals frequently contain impurities due to occluded mother liquor. The erroneous impression, which many users have, that all small crystals are impure probably results from the fact that this was true to a large extent when tank crystallizers were used chiefly. In this case the fine crystals were frequently mixed with the sludge at the bottom of the tank and were therefore not very pure, while the larger crystals were deposited on the suspension rods or on the sides of the tanks out of contact with the insoluble impurities.

It is safe to say that small crystals can be made just as pure or purer than large crystals in modern crystallization equipment. However, to meet the demand for specific sizes, crystallizers are designed so that the crystal size can be controlled if desired. This is not a serious problem as a very high percentage of the material crystallized in this country is used within a given plant or company and not sold to an ultimate consumer. Most producers realize that the appearance and size of the intermediate products are unimportant and therefore a larger quantity of material of uncontrolled size can be crystallized and the cost appreciably reduced.

If it is desired to control the size of the crystals to be produced, this in turn affects the type of crystallizer to be chosen for the job. And to see how the crystallizer can govern the crystal size a little consideration should be given to the mechanism of crystal growth.

Many theories[1,2,3] have been advanced regarding the formation of nuclei and their subsequent growth to form crystals. The latest of these has been suggested by Ron[4] and reported by Thompson.[5]

They claim that nuclei begin to form, in the presence of seed crystals as soon as the supersaturated region is entered (and the solubility curve is crossed). Some of these nuclei may then be deposited immediately on the comparatively large seed crystals due to the greater attraction of the latter. If the supersaturation is extended, the deposition of nuclei may not be able to keep pace with their formation and there will be free nuclei in the solution which may also grow by agglomerating with other nuclei. When the number of small crystals is sufficient to capture all of the nuclei as fast as they are formed, no more agglomeration of nuclei takes place and the number of crystals then remains constant.

These statements are of helpful importance in the design of crystallizers. They indicate that if large crystals are desired the equipment must be such that it is possible to keep the solution just beyond the saturation point. Otherwise, if the supersaturation is too great, a large number of small crystals will be produced. This means that small crystals are formed by a rapid precipitation whereas large crystals can be made only by a slow gradual building process.

Jeremiassen and Svanoe[6] claim there are four major conditions that must prevail in a crystallizer to permit controlled crystallization. (1) The solution must not be supersaturated beyond a certain limit. It is only when this limit is exceeded that precipitation of product on the walls of the unit and the uncontrollable formation of nuclei occur. (2) A large total crystal surface is required and its efficient utilization must be secured by exposing the crystals to fresh solution saturated to the maximum permissible degree. This practice will prevent excessive supersaturation and still allow a high rate of production. (3) The crystals must be kept in constant motion to prevent their growing together. But care must be taken to keep this motion from becoming so violent that a large number of crystals will be formed by attrition. (4) The rate of formation of new crystals should be equal to the rate of removal of full-grown crystals, to secure uniform crystal size.

All of the above theoretical aspects of crystal formation play an important part in the design of modern crystallizers. And crystallization is part of most processes.

cerning use of the salting out method it is necessary to have complete solubility data for the system.

COOLING CRYSTALLIZERS

Tank cooler is oldest

The oldest and simplest representative of this type is the tank crystallizer. From a production volume standpoint it is mainly of historical interest but is still commonly used for small scale batch crystallizations. It consists of an open tank, either rectangular or circular in section, exposed to the atmosphere which provides the necessary cooling. A hot saturated, or nearly saturated, solution is run into the tank and allowed to cool. Frequently, ropes, rods or lead strips are suspended in the bath to provide a base upon which crystals can grow. Crystals tend to build to a very large size on these strips and on the walls of the tank. They are removed by hammers or crushers in the case of the strips. This method also gives some crystals of various sizes all the way down to a fine sludge. Impurities are frequently occluded in the product from this crystallizer, especially in the case of tank bottom material. The obvious defects in this method are the large floor space it requires, its high labor cost, the large quantities of material it has in process, the lack of control and the consequent poor quality of the product.

The agitated batch crystallizer overcomes some of the faults of the tank crystallizer by providing agitation and artificial cooling. The water or other coolant is circulated through the cooling coils and the solution is agitated by the propeller blades on the central shaft. The agitation performs several useful functions. (1) It increases the rate of heat transfer and keeps the solution temperature more nearly uniform. (2) It produces a large number of nuclei so that the number of small crystals increases. (3) It provides a better opportunity for the crystals to grow uniformly instead of forming agglomerates. The over-all result is the production of comparatively small but uniform crystals.

Agitation has drawbacks

Agitated batch crystallizers have the drawback of being usable only in batch or discontinuous processes. In addition, their design gives rise to the deposition of solids on the cooling coils, an action that rapidly reduces the rate of heat transfer. This necessitates frequent cleaning by dumping or dissolving the adhering crystals which may result in the introduction of excessive water into the system.

A variation of this general type of crystallizer is the Acme crystallizer which employs two oppositely directed helical coil sections within the shell for heat exchange. Mounted on opposite sides of a center bearing, these coil sections, when revolved, provide a rotating circulating system with gentle stirring for the uniform distribution of cooling throughout the mother liquor. After crystallization is completed, a warm fluid may be circulated through the same helical coil sections.

Cooling coils, especially designed for insertion in agitated crystallizers, have been produced by a number of manufacturers. Most of these have been applied to the crystallization of sugar.

Types and Manufacturers of Crystallizers

Type	Modification	Manufacturers
Cooling	Tank	16
	Agitated Batch	1, 2, 5, 9, 11, 16
	Continuous Cooling (Swenson-Walker)	3, 5, 6, 7, 9, 10
	Double-Pipe	3, 5, 12, 13, 14
	Dual-Worm Crystallizer	15
	Wulff-Bock	18
	Lafeuille Rotary	4
	Bullovak Grainer	9
Evaporator	Crystallizing Evaporator	3, 6, 9, 15, 16, 17
Vacuum	Batch	1, 3, 5, 9, 16
	Continuous	1, 3, 5, 9, 16
Circulation	Cooling—Krystal	8
	Evaporator—Krystal	8
	Vacuum—Krystal	8
	Crystallizing Evaporator	15
	Classifying Crystallizer	9
Salting Out		16

MANUFACTURERS: (1) Acme Coppersmithing & Machine Co., Oreland, Pa. (2) Frank L. Allen, Inc., New York 1, N. Y. (3) Bullovak Equipment Division of Blaw-Knox Co., Buffalo 11, N. Y. (4) The Dorr Co., New York 22, N. Y. (5) Industrial Process Engineers, Newark 5, N. J. (6) L. O. Koven & Brother, Inc., Jersey City 7, N. J. (7) The Patterson Foundry & Machine Co., East Liverpool, Ohio (8) Struthers-Wells Corp., Warren, Pa. (9) Swenson Evaporator Co., Division of Whiting Corp., Harvey, Ill. (10) M. H. Treadwell Co., Inc., New York 4, N. Y. (11) Turl Iron and Car Co., Inc., New York 7, N. Y. (12) Henry Vogt Machine Co., Louisville 10, Ky. (13) Wolding Engineers, Inc., Norristown, Pa. (14) Worthington Pump & Machinery Corp., Harrison, N. J. (15) Zaremba Co., Buffalo 2, N. Y. (16) Many equipment manufacturers will construct these crystallizers to customer's specifications. (17) Many evaporator manufacturers will construct these crystallizers. (18) Not manufactured in U. S. A.

The Turl Iron and Car Co. makes revolving cooling coils mounted on a central shaft with each section having a separate water feed and a separate warm water drain. With this arrangement each section is fed cooling water at the same temperature so that more uniform cooling is obtained throughout the entire body.

The Rolston cooling coil, sold by Frank L. Allen Inc., is also designed to obtain a more uniform transfer of heat. In this case, the coils are so arranged that the outer run has its coolest end on the left while the next run has its coolest end on the right. These two runs, and each successive two runs, have a uniform mean temperature throughout.

Continuous crystallization

The continuous crystallizer of the cooling type with the largest total production in the United States is the Swenson-Walker. It has an open trough, 2 ft. across, and is provided with a semicylindrical bottom. A water jacket is welded to the outside, and inside there is a slow-speed, long-pitch agitator set as close to the bottom as possible to prevent build-up of crystals and to lift them up and shower them through the solution. It is built in standard units, 10 ft. long, giving 35 sq.ft. of cooling surface. The usual crystallizer is made up of four such sections. If the capacity requires a greater length, it is customary to arrange multiple decks with countercurrent flow of solution and cooling water, the solution cascading from one bank to the next lower bank. The hot concentrated solution is fed at one end of the crystallizer and the cooling water flows countercurrently in the jacket. Nuclei form near the entrance and grow regularly. The product from this crystallizer is usually fairly fine, about the size of coarse sugar, but uniform.

Crystallizers of the same type as the Swenson-Walker, with slight modifications, are of-

fered by a number of manufacturers. The M. H. Treadwell Co. Inc. builds such a water-cooled crystallizer which has been widely used in the sugar industry. It is made with double helical blades in lengths up to 40 ft. with diameters to suit the capacity required. The Patterson Type G crystallizer also falls into this class and can be built in any desired size. Crystallizers of this general type can be made of stainless steel, Inconel or other materials for use in corrosive service.

Pipe within a pipe

Another obvious method of providing the necessary heat transfer surface to cool a solution is to use a double pipe heat exchanger. There are some double pipe crystallizers which make no effective attempt to prevent crystal deposition on the cooling surface. But most crystallizers of this type are fitted with internal helical ribbons, which keep one side on the cooling surface clean by means of scrapers. These scrapers are in many cases spring-loaded so that they actually make contact with the inner wall of the inside pipe.

Double pipe crystallizers can be used in either a continuous or semi-continuous fashion. A good example of the application of this type of crystallizer is found in the chillers used in the petroleum industry to separate wax from oil. Representative of this equipment is the Vogt Oil Chiller which has a gear motor chain drive. Its scraper device consists of a series of overlapping blades, each attached to three U-shaped springs which in turn are fastened to the central core pipe. These springs hold the blades firmly but flexibly against the inner wall of the inside pipe and cause the blades to turn with the core pipe. At intervals along its length the scraper assembly is centered in the pipe by spiders.

Countercurrent cooling

The coolant passes through the annular space between the two pipes and the solution to be crystallized flows through the inner pipe countercurrent to the cooling liquid. Ammonia, brine or cold dewaxed oil may be used as the refrigerating medium and a chiller unit may be divided into sections so the chilling can be done by any combination of these cooling media to the end that the greatest economy possible may be obtained. The Buflovak crystallizer of this type is constructed to enable the coolant to be circulated through the jacket in spiral form. The standard diameter is 2 ft. and the length 10 ft. giving a heat transfer surface per section of approximately 60 sq. ft.

Another arrangement, particularly suited for direct expansion refrigerant cooling, uses two 27-in. I.D. shells arranged one above the other and each containing a cluster of seven 6-in. scraped pipes, connected together in series by return bends. The shells are maintained about three-quarters full of boiling refrigerant which is fed into the top shell and overflows to the lower shell.

The advent of continuous dewaxing, using solvents, brought with it the development of the inclined chilling machine by the Worthington Pump and Machinery Corporation. Because of its inclined position this unit is capable of handling large tonnages without a substantial increase in the size of the equipment involved. The inclined chilling machine is suitable for either ammonia or hydrocarbon refrigerants in as much as its elevated gas-return end readily permits the separation of liquid and gas without carryover of liquid to the refrigerant compressor.

Waxes from petroleum

Another recently-developed type of equipment, which is similar in principle to scraped-surface chillers although at present slightly different in application, is the Dual Worm crystallizer. Its chief use to date has been in the production of cakes of petroleum waxes. For this purpose, molten wax is passed directly to the hopper of the crystallizer where automatic controls regulate the flow of wax into the extrusion chamber. At the hopper the liquid wax is engaged by the two counter-rotating worms which propel it through a cooling chamber where the wax is converted into a semi-solid crystalline state. Emerging from the cooling chamber the wax is forced through a die head where it is continuously extruded into ribbons of constant cross-section. At this point, the ribbons may be cut into uniform lengths to deliver cakes or pellets to the packaging station. The commercial machine is producing conventional 10¼-lb. cakes at rates better than 2,000 lb. per hr. It is apparent that this new machine may have many other applications to crystallization processes.

The Wulff-Bock rocker type of crystallizer has been used considerably in Germany and England, but only to a very limited extent in the United States. Here it has been used to produce well-formed uniform alum crystals about ¼ to ½ in. in size. It consists of a shallow elliptical open trough set at a slight inclination and mounted on rollers so that it can be rocked from side to side in cradle fashion to provide circulation. Transverse partitions, extending part way across, may be interposed along its length to cause a zigzag flow of the solution. Operation is continuous and cooling is entirely by natural convection to the surroundings. The chief advantage of this crystallizer comes as a result of the very slow rate of cooling, which enables it to produce uniform crystals of unusually large size. The principal disadvantage lies in its relatively low capacity.

Sugar from cane and beets

The Lafeuille Rotary Rapid Cooling Crystallizer is widely used in the American and European beet sugar industry and in many cane sugar factories. Its cylindrical body is rolled by a gear drive while the heat transfer is carried out by means of circulating water in the diametrically arranged manifold of pipes. The rolling motion gives an ideal condition of contact between the growing crystals and new mother liquor. When handling sugar, it is possible to boil the mass to a greater density in the vacuum pan and work it more conveniently in this rotary unit than is possible with stationary crystallizers with moving mechanism. There is no stirring mechanism to break or to consume added power even when working with very stiff masses. These units are about 9½ ft. in diameter and 26 ft. long.

A somewhat different kind of crystallizer, which can be considered as belonging to the

cooling type, is the Buflovak Grainer. This equipment is used chiefly for the conversion of ammonium nitrate into a granular product. The solution of ammonium nitrate first is concentrated to about 97 percent solids in open pans heated with coils. The concentrated solution is poured into the graining kettle which is previously heated to reduce thermal shock. Cooling water is then circulated which causes the ammonium nitrate to solidify. The mass is granulated by means of the agitator which is set close to the bottom and to the side wall of the kettle. As the material cools down, it reaches a transition point at which it changes from one crystal form into another. During this transition some heat is developed which is sufficient to evaporate most of the residual moisture.

CRYSTALLIZING EVAPORATORS

Salts that exhibit little increase in solubility with temperature (e.g., sodium chloride) can frequently be crystallized in a conventional evaporator provided with some form of salt separator.

Salt separation necessary

Formerly it was common practice, when multiple effect evaporation was used, to feed each individual effect with its own supply of liquid. It was impracticable to feed from one effect to another, continuously, because the crystals suspended in the mother liquor would frequently obstruct the flow through the inter-connecting pipes. The use of equipment as the Buflovak continuous salt separator makes such operation possible. The concentrated liquid can be withdrawn from one effect to another continuously and without difficulty, because the salt crystals are precipitated into the lower chamber of the separator and removed continuously. The larger crystals settle into the cone bottom while the smaller or lighter crystals are carried along in the liquid. When they increase to the proper size, they also settle into the lower section from which they can be continuously or intermittently withdrawn. These smaller crystals, being in suspension, are carried along to the next chamber and do not settle or obstruct the connecting lines. Such salt separators are applicable to both the natural and forced circulation evaporator.

The sugar vacuum pan which is designed especially for the graining of sugar comes under the classification of a crystallizer evaporator. They are designed to provide the highest possible rate of evaporation and economy of operation. Frequently the construction consists of short vertical tubes of large diameter with a large downtake provided in the center. The average sizes vary from 6 ft. to 18 ft. (or larger) in diameter and with a normal strike capacity of from 20 to 120 tons.

Impellers speed circulation

Evaporators which are to be used for salt evaporation are often provided with a power-driven impeller to insure uniform and rapid circulation of the liquor.

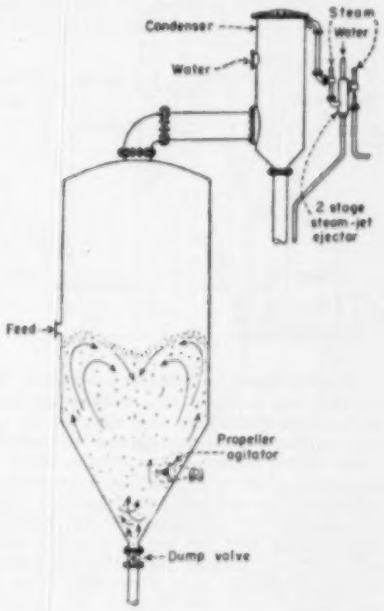
Another crystallizer of this class is the salt grainer used in the production of common salt and described by Badger and Baker. The grainer is a long shallow pan, usually 100 to 150 ft. long, 15 to 20 ft. wide and about 2 ft. deep. A heating coil is provided in the form of a number of passes of standard pipe, below which is a system of reciprocating rakes. During operation, the brine does not actually boil and evaporation takes place only at the surface. Salt that settles to the bottom is gradually moved to one end where it passes over a drain board and finally to a conveyor.

VACUUM CRYSTALLIZERS

Cooling and evaporation

In this type of crystallizer, the solution is exposed to a pressure below its corresponding vapor pressure resulting in both evaporation and cooling. Normally, a hot saturated or nearly saturated solution is fed to the crystallizer body held under a vacuum. Usually its feed temperature will be above that of the boiling point corresponding to the vacuum and the solution will tend to cool to this temperature by adiabatic evaporation at the surface. Crystallization results due to cooling and also to the evaporation of the solvent, frequently water.

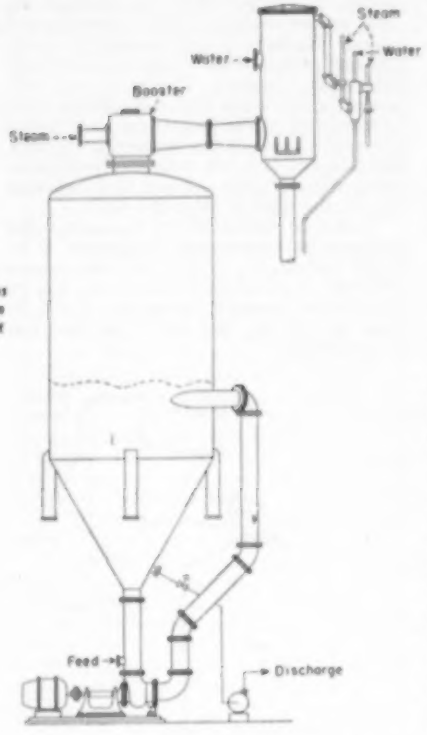
Vacuum crystallization may be accomplished batchwise or continuously. Equipment is designed accordingly. In principle, the vacuum crystallizer is essentially a vessel which may be evacuated to extremely low pressure, usually by steam jet ejectors, into which the feed may be introduced.



Batch vacuum unit

A typical batch vacuum crystallizer is operated in this way: The charge of hot concentrated solution is introduced into the crystallizer body. Here it is subjected to a gradually increasing vacuum which causes cooling along with evaporation. When the desired final temperature is reached, the vacuum is broken and the charge dumped for filtering or centrifuging.

In the continuous single stage vacuum crystallizer, feed solution (or slurry) is introduced continuously into the body at the bottom and a constant high vacuum is maintained during the operation. The cooled solution or slurry is continuously pumped out so that a constant volume and liquor level in the crystallizer body is maintained. In the multi-stage continuous crystallizer, it is customary not to separate the crystals from the solution between stages.

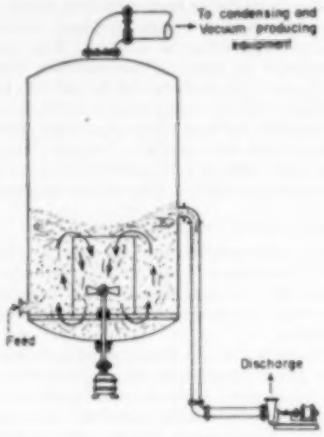


Continuous vacuum unit

In either batch or continuous operation, the solution can be cooled to a temperature below that of the available cooling water by the use of a steam jet thermo-compressor or "booster." This device utilizes the aspirating effect of expanding steam in a nozzle and Venturi-throat arrangement to compress low temperature vapors to a pressure and temperature in the condenser high enough that the available cooling water will effectively condense them. For the removal of non-condensible gases, a two-stage steam jet air ejector with intercondenser is ordinarily employed.

The Trona crystallizer is similar in principle to other vacuum types but it makes use of a vertical draft tube and a centrally located propeller-agitator which is effective in preventing short-circuiting of the feed.

Vacuum crystallization offers many advantages. Heat is not transmitted through a solid medium which may become scaled, salted up or corroded. The end temperature is not limited by the temperature of the available cooling water. Construction permits the use of materials for handling corrosive solutions. Operating costs are low and relatively easy control and regulation of conditions are possible. On the debit side of the ledger, in addition to the necessary steam, more cooling water is required than in a mechanical type crystallizer. Vacuum crystallizers play an important role in modern processing methods.



Trona crystallizer

CIRCULATION TYPE CRYSTALLIZERS

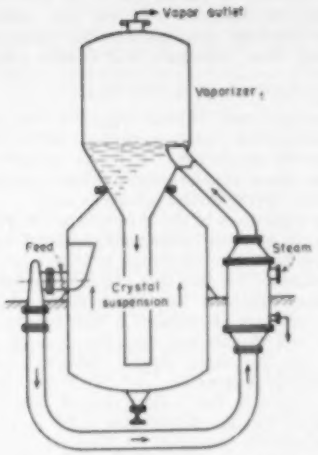
The operation of crystallizers of the circulation type depends on the maintenance of the solution just within the supersaturated region such that no new crystals are formed and crystal growth takes place only on crystals already present in the solution. To remove the supersaturation effectively requires a large crystal surface and the crystals must be contacted with the supersaturated solution as it is produced. In most units of this class, a uniformly supersaturated solution is conducted upwards through a dense suspension of crystals. The classifying action in the suspension container keeps the large finished crystals suspended in the bottom layer and the smallest crystals in the top layer with the intermediate sizes between. The saturated solution leaving the crystallizer container is mixed continuously with feed liquor, the mixture is again supersaturated and the cycle repeated.

Solubility data decides

As pointed out for other classes of crystallizers, the type of equipment to be used in a crystallization process depends primarily upon the solubility characteristics of the solute. The supersaturated solution can be produced by evaporation, cooling or by the application of a vacuum and crystallizers are manufactured using all three methods.

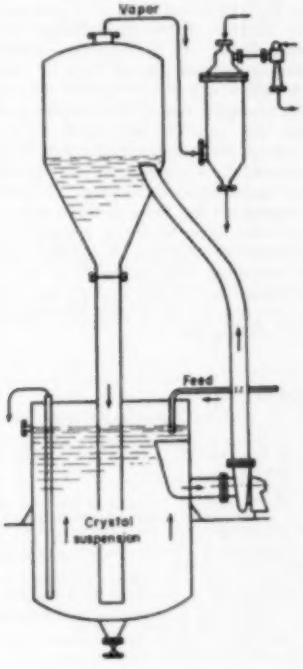
The "Krystal" evaporator crystallizer is an example of the circulation type crystallizer. The feed liquor upon entering this unit is mixed with the circulating mother liquor and forced by a pump through a tubular heater to the

Evaporator crystallizer



vaporizer body above. There the solution becomes supersaturated and flows down the central pipe and up through the dense crystal suspension in the crystallizer body. The vaporizer is especially designed to provide efficient release of the superheat in the liquor. The driving force, or pressure differential required to vaporize a certain amount of liquor per unit of time per unit surface is claimed to have been reduced to a minimum. The result is an even vapor release over the entire liquor surface which makes liquor entrainment a negligible factor even for high rates of vaporization.

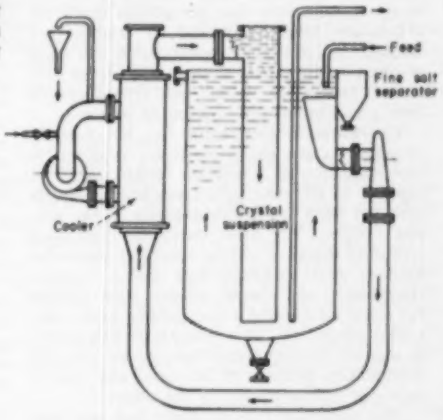
Krystal vacuum unit



It is apparent that the heating surface in the heater must be sufficiently large to take care of the heat requirements of the crystallization. In the crystallizer body sufficient crystals must be suspended to achieve almost complete release of supersaturation. The individual crystals must be in constant motion to prevent their growing together, but the motion must not be too violent or new crystals will be formed by attrition. The amount of crystals carried in suspension varies for different chemicals and also depends upon the character and amounts of impurities present and the crystal size desired. The discharge of the finished crystals can be arranged by gravity, or the crystal slurry can be discharged through a continuously operated slurry pump.

No heater needed

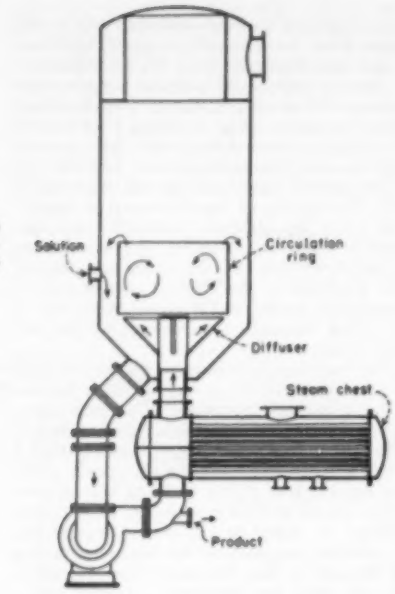
The vacuum crystallizer of the Krystal type is quite similar in design and operating features to the evaporator crystallizer. The main difference is that the vacuum unit requires no heater. The feed is mixed with the circulating mother liquor and conducted up to the vaporizer where the sensible heat of the feed and heat of crystallization are utilized to evaporate solvent. The solution is cooled to the desired temperature by adiabatic evaporation. An interesting feature of this unit is that the crystallizer container is an open tank not subjected to vacuum and is connected with the vaporizer or vacuum chamber through a barometric leg.



Krystal cooling unit

The crystallizing chamber of the Krystal cooling crystallizer is similar in design to the other Krystal units but the supersaturated solution is produced by cooling in a shell and tube heat exchanger. The construction, operation and use of Krystal crystallizers are fully described by Svanoe.[7]

The Zaremba crystallizing evaporator employs circulation of the solution but does not have a separate container for the crystal bed. The solution is circulated by means of a pump through the heat exchanger up to the evaporator body. Only some of the large crystals are removed as product and the rest are passed with the liquor through the steam chest and from there to the evaporator body through the fluted



diffuser. The unit is so designed that no boiling actually occurs in the steam chest. It is claimed by the manufacturer that the diffuser maintains a constant recirculation and all crystals pass through the boiler zone approximately five times as often as they pass through the pump and steam chest. This should give crystal growth with a minimum consumption of power.

The Swenson Evaporator Co. has recently introduced a new classifying type crystallizer for the production of a uniform crystal size. The capacity of the new style crystallizer compares with the range heretofore available in the simpler designs. The new continuous crystallizer comprises mainly a cooling system of either the flash or heat exchange type and a separate classification and magma control zone wherein the dissolved material is precipitated under controlled conditions. It is possible in this design to separate the supersaturation system from the precipitation portion of the cycle and control each one independently of the other.

Crystal size variable

This particular type of design has not heretofore been available. Its separation of control should make it possible to vary capacity within much wider limits, and to vary crystal size also between wider limits although not variable to the same extent as the capacity. The same design features and controls can be applied to the regular evaporating type crystallizer commonly used where the solubility curve of the material precipitated is quite flat with respect to temperature, or in those processes where a concentrated liquid is the desired product—rejecting a crystallizable salt. It was necessary to develop some rather unique instrumentation for the classifying crystallizer in order to obtain continuous indication of magma density in the various locations where control is important. Also, selection of pumps had to be done very carefully to maintain a crystal size without undue breakage and spontaneous nucleation resulting from turbulence and velocity effects.

CRYSTALLIZATION BY SALTING OUT

Thompson and Molstad suggested that crystallization using organic precipitants has definite commercial possibilities.[5] They also pointed out that the use of organic solvents offered improved fractional crystallization in many cases.

Organic precipitant

The application of this principle to the preparation of iron-free aluminum sulphate using ethanol has been employed by Gee and his co-workers.[9] The fact that aluminum sulphate can be precipitated from its aqueous solution by the addition of ethanol has long been recognized, and the marked solubility of ferric sulphate in this same organic solvent is well established. Laboratory and batch pilot-plant experience with this system showed that crystallization was the critical step as far as purity of product was concerned. A 2-ton-per-day continuous pilot plant demonstrated conclusively the chemical and mechanical feasibility of such a process for iron-free alum production. It also indicated the economic possibility of utilizing relatively expensive organic solvents for producing cheap-tonnage inorganic products.

The equipment in which materials may be crystallized by salting-out varies from a simple agitated tank to an evaporator-crystallizer. An interesting adaption of a standard crystallizer of the evaporator type to the crystallization of anhydrous sodium sulphate using ethylene glycol as the organic material has been suggested by Vener and Thompson.[10] The proposed method involves the controlled feed of a concentrated aqueous solution of sodium sulphate (or the decahydrated salt) to an evaporator-crystallizer containing an organic liquid such as ethylene glycol which is much less volatile than water. The organic liquid should be completely miscible with the aqueous salt solutions for the conditions of temperature and composition to be encountered. To minimize salt deposit on the heating surfaces, the change in solubility with temperature for the anhydrous salt in the binary solvent must be either reversed or rendered practically invariant. A marked lowering of the anhydrous sodium sulphate solubility, due to the salting-out effect of organic solvents such as ethylene glycol, is also advantageous in reducing salt deposit.

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DEPARTMENT OF THE MONTH. This department appears in each issue among the ads. Are you using it? To call it to your special attention we are starting it here this month

Industrial Notes

NEW LOCATIONS

Chemical Construction Corp., New York, has moved its headquarters to 488 Madison Ave.

W. B. Connor Engineering Corp., manufacturers of activated carbon air recovery and purification equipment and adjustable air diffusers, has moved its main offices, plant and laboratories from New York to Danbury, Conn.

Jeffrey Mfg. Co., Columbus, Ohio, has moved its West Virginia district office to 403 City Ave., Beckley. The company's district office in Cleveland is now located in the Hanna Bldg.

Raybestos-Manhattan, Inc., Passaic, N. J., has moved its New Orleans office and warehouse to 920 Calliope St.

National Distillers Chemical Corp. has transferred its sales offices to the administration building of its new plant on State Rd., Ashtabula, Ohio. Sales activities for the corporation have been carried out for the past two years at 120 Broadway, New York, where its executive offices will remain.

United States Rubber Co., New York, has transferred its sales and technical service activities for printing materials from New York to Providence, R. I.

Alan Porter Lee, Inc. has moved its offices to 81 Miller Rd., Morristown, N. J. The company specializes in the construction and design of oil, soap, fatty acids and glycerine machinery and processes.

Krebs & Co., consulting engineers, has moved to Delaware Trust Bldg., Wilmington.

D. J. Murray Mfg. Co., manufacturer of unit heaters, has moved its Chicago office to 612 North Michigan Ave. O. J. Malina, sales manager of the unit heater division, is in charge of the office.

NEW LINES

Warren Steam Pump Co., Warren, Mass., has acquired a line of screw pumps through the purchase of the Quimby Pump Division of H. K. Porter Co., Pittsburgh. The pumps are designed to handle any non-abrasive liquid at moderate and high pressures.

Fine Organics, Inc., New York, has begun the manufacture of ten products designed to cover the major needs of industrial and motor fleet mechanical overhaul and maintenance shops. They include quaternary ammonium disinfectant, solvent emulsion grease cleaner, cresol emulsion degreaser.

Hulman & Co., Terre Haute, Ind., acquired a line of chemicals for the metal-working, textile and water treatment fields when the Rumford Chemical Works in Rhode Island became its subsidiary recently. J. Whitney Macdonald has been named general manager of the subsidiary while Albert E. Marshall, formerly executive head of the company, remains on in an advisory capacity.

Ideal Industries, Inc., Sycamore, Ill., now produces a small, hand-operated tool for removing insulation from wire as a result of its purchase of Pyramid Products Co., Chicago. All manufacturing and sales activity has been moved to Ideal's plant.

NEW FACILITIES

Hercules Powder Co.—A plant at Hattiesburg, Miss., for the production of toxaphene, a chlorinated camphene insecticide. H. K. Ferguson Co., New York, will construct the plant where initial production is scheduled for February 1951.

Pittsburgh Plate Glass Co., Pittsburgh, Pa.—A fourth tank with two drawing machines at its Clarksburg, W. Va., window glass producing plant. The building program and installation of equipment should be completed by May 1951.

A. E. Staley Mfg. Co., Decatur, Ill.—A solvent extraction unit for processing soybeans which has a capacity of 800 tons daily. This brings the company's total capacity for processing the soybean yield to more than 3,500 acres per day.

Bjorksten Research Laboratories, Chicago—A 168-acre tract of land in Madison, Wis., to be used for erection of buildings to house new testing units, scientific equipment and laboratories.

Pennsylvania Salt Mfg. Co. of Washington, Portland, Ore.—Expanded storage and warehouse space to take care of accumulation of heribicides and insecticides produced at the plant during winter months. Also, improvements have been made to buildings and facilities for the manufacture of DDT, chlorates, chlorine and caustic soda.

International Paper Co., New York—Two new factories for the production of paper milk cartons. They will be located in Atlanta, Ga., and Kansas City, Kan.

Irvington Varnish & Insulator Co., Irvington, N. J.—A Chicago office for its Cap-Seal Division.

J. F. Pritchard & Co., Kansas City, Mo.—A district office in New York to serve New York, Connecticut, New Jersey and eastern Pennsylvania.

(Continued on p. 234)

Show at Chicago

Sixth in the biennial series, the National Chemical Exposition again brought together many seekers after new ideas. Here is a selection of what they found in new equipment.

EDITORIAL STAFF

During the week of September 5, Chicago's section of the ACS again played host to the National Chemical Exposition, as it has each even numbered year since 1940. A little smaller than some of the past Chicago Shows, exhibitors numbered about 140 after elimination of duplication. Of these, 68 showed plant scale equipment, instruments, materials of construction, and packaging equipment and supplies. For the rest, there were laboratory apparatus and instrument makers, publishers, societies and a few consultants. Unfortunately from the standpoint of chemical engineers, the first category of plant scale exhibits has been falling off relatively in comparison with the laboratory end of the Chicago event, a fact that was especially evident this year. Our present report is concerned only with that category, and only with those items that have been introduced in the two-year interval since the last Chicago Exposition in 1948.

CONSTRUCTION MATERIALS

The new Vinyon N work clothing made by Chem-Wear Corp., claimed to resist 95 percent of the corrosive chemicals used in industry, was exhibited in the Union Carbide & Carbon booth, as were several new developments in Karbate, made by the National Carbon Division. Impervious graphite is now going into a circulating steam-jet tank heater, an improved self-lubricating globe valve with a Teflon seal and a larger standard shell-and-tube heat exchanger with 70.6 sq. ft. of external heat transfer surface, a removable Karbate tube bundle and a steel shell.

Glass equipment too was represented in the "new" column. Corning Glass Works is now offering a "package" glass distilling column in diameters to 12 in., with its bubble trays molded of Vycor. Industrial glass heat exchangers are now being produced ready to assemble. The company also featured its new extra tough tempered glass piping which is to replace the ordinary industrial piping and is said to reduce greatly the possibility of breakage from strains during installation or use.

Gradually, it appears, plastic equipment is beginning to come into its own. Kemplas, made from modified phenolic resins produced by Penn Salt and fabricated by General Ceramics & Steatite Corp., was shown by the latter organization. This material (described in detail in our New Equipment section this month) is produced both in cold cast and in luminated forms and in many corrosion resisting applications is said to outlast greatly all materials formerly available. Pipe, valves and fittings, vessels, pumps, towers and other equipment forms will be available.

Automatic control of alloy valves has been receiving a great deal of attention from Hasco Valve & Machine Co., as its exhibit indicated. This concern is now making a flush-bottom valve for kettle discharging, equipped with a diaphragm operator. Large Y-valves are being similarly equipped, while chemical valves of various kinds are being supplied with both open-and-shut and throttling type operators.

Micro Metallic Corp has gone ahead with the development of new types of filters having porous stainless steel filtering surfaces. The latest type, the Surfamax, consists of a series of round or rectangular elements or diaphragms, each formed of two pieces of porous stainless welded together around the periphery and sprung apart at the center. Elements are joined internally at their centers and a sufficient number assembled to give the desired area. A large area in minimum volume can thus be produced. Capacities from 100 to 10,000 gpm. can be attained, at pressures to 10,000 psi.

Dow Chemical's line of Saran-lined pipe, valves and fittings has been ex-

tended and now includes Grinnell-Saunders type lined diaphragm valves as well as non-lubricated, lined plug valves. The former uses a Saran-rubber diaphragm, but other diaphragm materials such as neoprene and butyl can be used. Both are pressure-rated at 150 psi. maximum. The exhibitor was the Saran Lined Pipe Co.

Stainless steel is going into an ever increasing variety of pipe, valves and fitting specialties, especially in the sanitary line. Niagara Filter Corp. is now offering a wide line of drip-proof cocks. These are standard makes modified by Niagara to include rubber O-ring gaskets at the upper and lower ends of the plug. All drip is said to be eliminated even at pressures above 75 psi. Tri-Clover Machine Co. has added considerably to its stainless fitting line, now making a magnetic trap, a broad-sweep tee, a universal pipe joint and a sliding-gate valve.

Chemical porcelainware is being made now in larger sizes, as the U. S. Stoneware exhibit showed. This same concern is offering a new ceramic grinding medium for ball mills under the name of Borundum. The new media are 50 percent harder and 75-80 percent heavier than conventional media such as porcelain balls and flint pebbles. Faster grinding, less product contamination, greater mill capacity are claimed. Larger sizes for the company's Tygon plastic tubing were also in evidence.

Although it is still experimental, Worthington Pump & Machine Corp. showed its Haveg plastic centrifugal pump for which higher mechanical efficiency is claimed than is usual in chemical pumps. Several pumps in the 1½-in. size are undergoing field testing. They employ a mechanical seal and are un-armored for light weight and comparatively low cost.

FLUIDS AND HEAT TRANSFER

Groen Mfg. Co. featured its new Rota-Therm jacket for stainless steel kettles. This is said to increase heating speed materially by putting the mechanical energy of the entering steam to work in scrubbing the condensate film from the heat transfer surfaces and so giving maximum heat transfer rate. In place of the conventional steam inlet, two or more inlets are placed near the top of the jacket. Entering steam is directed through combination baffle-nozzles so as to circle the jacket at high velocity, sweeping away condensate and non-condensable gases.

Following experimental use, regular production has just recently been started on the Homestead-Reiser lubricated plug valve exhibited by the Homestead Valve Mfg. Co. This valve uses a cylindrical plug and has a novel feature which gives it its name of Self-Seald. Supplementing the lubricant seal is a wedging action under line pressure, brought about by splitting the plug diagonally from top to bottom so that pressure causes the plug surfaces to press outward against the sealing surfaces of the body.

For small pumping applications with corrosive liquids the Illium Corp. showed its new 30-gpm. Illium centrifugal pump. Normally equipped with a stuffing box, it can be provided with a mechanical seal or with Teflon or other special packings if desired. The LaBour Co.'s Type G self-priming centrifugal pump was exhibited in its latest modification, the Type BGM. The most novel feature of this pump is that it has no stuffing box or conventional seal but has a centrifugal fluid seal, without mechanical contact. In the BGM modification the pump is close-coupled to the motor, eliminating the pump bearing bracket and reducing the height.

New proportioning pumps were shown by two manufacturers. Wright Chemical Corp. exhibited new Nelson pumps which are now made also in motor driven models. Earlier Nelson pumps were operated by hydraulic power, either by pressure takeoffs from a reciprocating pump in the main line, or through pressure of a pilot fluid controlled by an orifice regulator measuring main line flow. Delivery of the new motorized pump is widely adjustable through adjusting the amount of lost motion between a drive rod and the full floating pump plunger. The second proportioning pump exhibitor, Milton Roy Co., showed a new miniature pump for feeding from a few to as many as 725 milliliters per hr. of clear liquids. This "miniPump" uses a ½-in. plunger, adjustable from zero stroke to full capacity while operating. It is driven by either a motor or an air cylinder, at pressures to 1,000 psi. Another new Roy pump is of sanitary construction, with air-cylinder drive. A modification of the air-driven pump is a so-called pressure generator for hydrostatic testing in which the ratio of air to liquid cylinder diameters serves as a multiplier of the air pressure. The generator will pump the test vessel up to test pressure, then hold that pressure indefinitely.

A novel variation of the flexible impeller idea in positive rotary pumps was shown in the Subcomco pump made by Submerged Combustion Co. of America. An impeller of flexible material such as neoprene has a num-

(*Continued on page 194*)

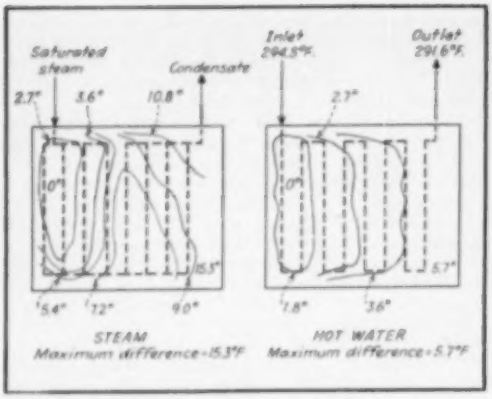

Fig. 1—Water heating of press plates gives only 5.7 deg. variation in surface temperature, compared with 15.3 deg. for steam.

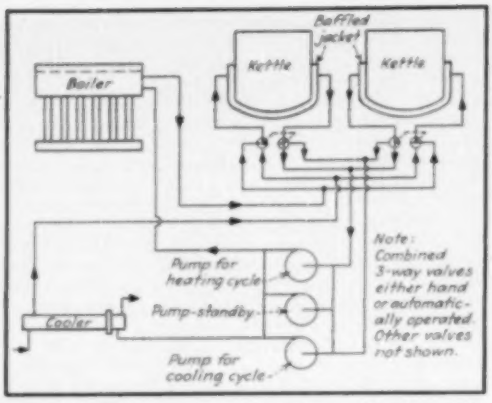

Fig. 2—The liquid system for these kettles can be automatically controlled to conform to a rigid heating and cooling cycle.

Why use vapors or gases when it may be better to Heat With Liquids

Liquid heat transfer systems are better adapted to surface temperature uniformity, close temperature control, and alternate heating and cooling processes than vapor or gas systems. The newer liquid heat carriers offer many advantages over the old, and heating systems using these liquids operate at higher efficiency.

PAUL L. GEIRINGER

Liquid heating systems are superior to the more conventional types for many applications. These systems are better adapted to surface temperature uniformity, close temperature control, and alternate heating and cooling processes than vapor or gas systems.

Losses due to condensate flashing and high pressure requirements discourage the use of steam above 250 deg. F. Mercury, combustion gases and air are used with some success for high temperature heating. Full satisfaction, however, cannot be obtained. Mercury is expensive, dangerously poisonous, and easily forms the oxide when used in an environment of steel and air. Air and combustion gases, when heated to high temperatures, require large ducts and large volumes must be circulated in order to transport heat energy from one point to another. The specific heats and the film coefficients of these gases are very low and the efficiency of the heating system tends to be correspondingly low. No uniformity of surface temperatures is attainable with these systems, and the power consumption is high.

PAUL L. GEIRINGER is chief engineer of the American Hydrotherm Corp., 215 E. 27th St., New York. *This article is based on his paper presented before the semi-annual convention of the American Society of Mechanical Engineers, St. Louis, June 19-23, 1950.*

UNVARYING HEAT TRANSFER

Unlike vapors, liquid flowing through a pipe has, at a given cross-section, the same heat transfer coefficient at any point of the periphery. The variation will occur only in an axial direction. However, by keeping the inlet and outlet temperatures close together, the temperature variation in the system can be reduced to only a few degrees.

Fig. 1 shows measurements of surface temperatures of press plates heated with steam and with hot water. With steam heating, temperature differences due to varying thickness of condensate film up to 15.3 deg. F. are reached. With water, differences of 5.7 deg. F. maximum are recorded.

Chemical heat carriers used in the vapor state would show still greater temperature gradient due to the low latent heat of the vapor and low specific heat of the condensate.

This non-uniformity is an obvious disadvantage where contact surfaces at uniform temperature are required. It is not so much of a disadvantage in kettle heating, although it reduces efficiency of operation.

In liquid heating systems producing high temperature air or other applications where close surface temperature is not required, the heat carrier returns to the boiler at considerably lower temperature. This gives higher boiler efficiencies, as return line losses are reduced.

CLOSE CONTROL POSSIBLE

Many chemical processes require heating up to high temperature and subsequent cooling to a predescribed level. The gradual heating up of platen presses is feasible only with liquid systems. Certain fiberboards

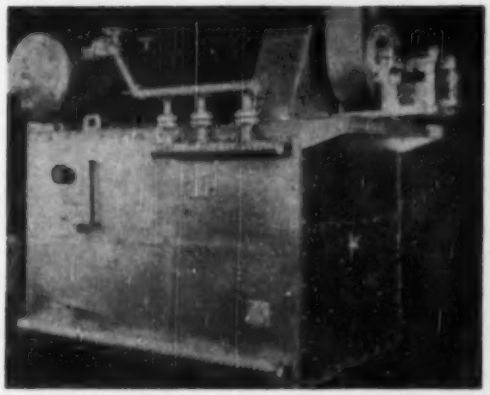

Fig. 3—Forced circulation in this boiler allows heating near decomposition point while safeguarding from decomposition.

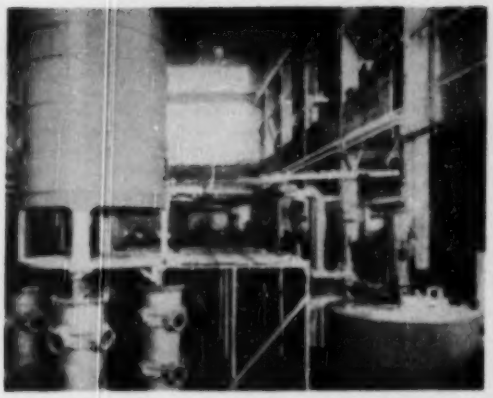

Fig. 4—Investment costs are low in this high temperature salt system which includes a boiler and steam-traced pipes.

are produced by pressing and slow heat applications; rapid heat might destroy the material due to rapid evaporation of the moisture content. Some of these processes are performed with such regularity that automatic program control instruments can be applied. This control problem is rather difficult when using vapor heating.

Fig. 2 shows a schematic diagram for the heating and cooling of jacketed kettles. The jacketed space is baffled to increase the velocity of the liquid, thus obtaining good heat transfer characteristics. The combined three-way valves can be automatically controlled to conform to a rigid heating-cooling cycle.

WATER IS BEST UP TO 400 DEG. F.

Of all the compounds available, water is by far the best heat carrier. It has the highest specific heat and the best heat transfer properties. It has the great disadvantage, however, that at temperatures over 400 deg. F., the vapor pressure becomes too high. In Europe, heating plants using water up to 2,800 psi. have been installed and operated. Installations using high temperature water under pressure, would, however, be too expensive in this country. This is because of the difference in thickness of steel required by the European and American codes.

HEAT CARRIERS BEYOND 400 DEG. F.

Heretofore, oils in the liquid state or a mixture of diphenyl and diphenyl oxide (Dowtherm A) in the vapor, and to lesser extent the liquid state, have been used most often to reach into the high temperature region. Certain drawbacks of these heat transfer agents are immediately apparent. At high temperature, both of these carriers are very flammable. Both have a rather low surface tension and therefore easily penetrate the smallest crevices, gaskets and stuffing boxes.

The heat transfer characteristics of oils are not favorable nor are the viscosity curves. At lower temperatures the low pumpability is a considerable disadvantage.

The diphenyl mixture of 500 deg. F. is at atmospheric pressure; at 700 deg. F. the vapor pressure is approximately 110 psia. Therefore, the heating system for this carrier must be designed for pressure.

Oils are more commonly used for smaller plants where only small volumes are required for circulation, and are best applicable between 400 and 550 deg. F. Diphenyl oxide mixture is used up to 680-700 deg. F.

One of the best heat transfer media in the temperature range of 400-550 deg. F. and maximum 600 deg. F. is a chlorinated biphenyl. It is known as Aroclor and Hydrotherm N. 500, and is produced by Monsanto Chemical Co. For temperatures in the neighborhood of 600-650 deg. F., a silicate, Hydrotherm No. 700, shows excellent characteristics. The temperature range of 650-700 deg. F. is at present the most difficult to satisfy by means of organic liquids. All such liquids now in use show deterioration at these temperatures to varying degrees. Hydrotherm No. 700 seems subject to slightly greater decomposition than Dowtherm A at extended upper limit operation.

Choice of the carrier for the 650-700 deg. F. range would, therefore, be dependent on other characteristics. If the high freezing point and low surface tension of Dowtherm A were of no great concern, then it would seem preferable to Hydrotherm No. 700 in this range.

If, however, alternate heating and cooling requirements must be met, with 650-700 deg. F. operation not continuous, and the cooling extended to low temperatures of 0-50 deg. F., then Hydrotherm No. 700 is more applicable.

Beyond 700 deg. F. and up to 1,000 deg. F. high temperature salts may be utilized. These salts are mixtures of sodium nitrite and potassium nitrate, and have been successfully applied in a number of plants. They are known as Hydrotherm No. 1200, Hi-Tec, and Beth-Tec.

Even beyond this range it is possible to find heat transfer agents. Gallium seems to be one which would satisfy temperature requirements even in excess of 3,000 deg. F. Its price, however, is prohibitive. The low specific heat is another drawback.

The following discussion will, therefore, concentrate on the other three heat transfer fluids.

BIPHENYL CARRIER IS NON-FLAMMABLE

The chlorinated biphenyl used as a heat carrier has the great advantage that it is practically non-flammable. It has been heated far beyond 600 deg. F.; its gases were in contact with direct flame, and no explosion or fire could be observed. Hot fluid poured directly into the fire partly extinguishes it. Smoke is developed but actually no fire can be sustained. A second basic advantage is the fact that it is pumpable with centrifugal pumps even at 50 deg. F. The pour point is 19.4 deg. F. It has a boiling point between 645 and 710 deg. F. It is

fully stable up to 540 deg. F. The vapor pressure at 600 deg. F. is only 6 to 7 psi. Its application in low pressure systems is, therefore, possible. The viscosity as well as heat conductivity are considerably more advantageous than those of any oil and therefore better heat transfer coefficients are obtainable. The surface tension of the fluid is favorable. The corrosion problem is also rather simple with this fluid; practically all metals are inert to this heat carrier. However, due to the high temperatures, the application of cast steel and stainless steel for parts subjected to erosion is recommended.

SILICATE IS FLUID OVER WIDE RANGE

An interesting fact about silicate is that it can be kept in the liquid state from minus 40 deg. F. up to plus 700 deg. F., and even somewhat above this point. It has a very high fire point. The specific heat in the high temperature range is rather favorable, and exceeds 0.7. The viscosity is very low. These properties are excellent for heat transfer characteristics. Even at 700 deg. F. the vapor pressure is negligible and it is possible to design practically pressureless heating systems. For heat transfer applications up to 650 deg. F., and for cooling processes using temperatures near 0 deg. F., this fluid is ideally suited. At present the production is small, so its price is higher than that of the more common heat transfer fluids.

SALTS BEST ABOVE 700

For temperatures beyond 700 deg. F., a number of liquids have been suggested. It is rather difficult to produce an organic liquid, a silicate, silicone, or fluorine compound which has such strong molecular associations that a temperature beyond 700 deg. F. will not cause disassociation. (The writer is experimenting with a new silicate compound which promises stability to 750-800 deg. F.)

At present it seems that the high temperature salt mixture is the best answer to attaining this temperature level. A mixture of 50 percent sodium nitrite and 50 percent potassium nitrate by weight forms a thermally stable fluid at temperatures above 282 deg. F. Up to approximately 850 deg. F. black steel piping may be applied; above this temperature stainless steel should be used. The salt itself is not subject to decomposition up to 1,200 deg. F.—it has even been used above this temperature range. The above mixture of the two chemical compounds forms a eutectic, both components freezing at the same temperature which is below 300 deg. F. The salt is also soluble in water.

This salt was developed by DuPont together with Bethlehem Foundry & Machine Corp. American Hydrotherm Corp. cooperates in the installation of these systems.

The specific gravity of this fluid varies from 1.68 to 1.97. The specific heat is approximately 0.3-0.37. The viscosity curve is fairly favorable.

One of the basic questions is whether high temperature salts are sufficiently safe in operation. This eutectic salt mixture offers no more danger than that inherent in any liquid at these high temperatures. Paraffin has been injected into the salts at 1,100 deg. F. Cracked gasoline, gas, oil and oil mixture with fluorine or sulphur were even injected below the surface of the salt at 1,100 deg. F. In all these instances the hydrocarbons merely vaporized and burned. The chemical analysis showed that there were practically no chemical reactions.

POSSIBLE FUTURE HEAT CARRIERS

The group of silicones seems to be most promising as heat carriers in the high temperature heating field. The quantities now produced, however, are so small and the price is so high, that at the present time it seems that no fluid in this group has been found which fully meets all requirements.

The group of glycols and their derivatives is another source of possible heat carriers. Their boiling point is in the neighborhood of 540-610 deg. F. They decompose, however, and therefore have limited applicability.

Fluorine compounds may be further selections as heat carriers but at present it appears that no practical compound in this group has been found.

CHARACTERISTICS OF BASIC EQUIPMENT

The boilers or heaters for the chlorinated biphenyl and silicate carriers must be carefully laid out to prevent the fluid from overheating in case the circulation is suddenly stopped. Boilers with large combustion spaces fulfill this requirement. The boilers or heaters must be arranged so that a positive circulation is secured. Forced circulation boilers have been developed for this purpose which comply with these requirements and permit the heating of the fluid close to the critical decomposition point. In this way the applicability of the heat carrier is extended. The positive forced circulation in these boilers safeguards the liquid from decomposition. It is further possible to obtain in this way a design affording large heat output within a limited space, particularly with low head room. Such a boiler is shown in Fig. 3.

The pumps used for circulation should be carefully designed to meet the high temperature requirements. A cast steel case, with all parts subjected to wear of stainless steel, has been found to be most satisfactory. All the vital revolving parts such as bearings and stuffing boxes should be water cooled. Mechanical seals are preferable. The efficiency of these pumps rate between 72 and 82 percent.

The valves must be designed for high temperature service, with stainless steel trim. The stuffing boxes must be equipped with a packing material adequate for the service, and must be long enough to safeguard against losses. Valves should be designed to permit throttling and have low resistance characteristics. Cock or globe valves are preferable.

Below requirements of 1 million Btu./hr., laboratory package units are considered practical for heating and cooling requirements. Basically, they contain heater, cooler, pump, storage tank, and controls.

A high temperature salt system is shown in Fig 4. Boilers of 1 million and 5 million Btu./hr. are available. Steam-traced pipes are used in case the fluid should freeze in the pipes. It is also possible to dissolve the salt in water, later evaporating the water from the fluid.

These high temperature salt systems are very dependable, and the investment costs are far below those of other equipment by which equivalent temperatures can be obtained.

Certain safety precautions are, however, necessary. Wood chips, paper, rags, etc. should not be allowed to drop into the molten material because they readily start to burn. The same applies to powdered coke and coal, magnesium and metallic alloys and some chemical compounds.

FUEL COSTS

The over-all efficiency of liquid heating systems, based on the experience of existing installations, is approximately 70 percent at a fluid temperature of 500 deg. F.

Assuming a No. 6 oil price of 6 c. per gal., the resulting fuel cost would be 57 c. per million Btu./hr.

Equivalent high pressure steam heating systems operate at over-all efficiency of 50 to 60 percent, and result in fuel costs of 66 c. to 80 c. per million Btu./hr.

With electricity, assuming an efficiency of 98 percent and cost of 2 c./kwh., the corresponding expense would be $5.80 per million Btu./hr.

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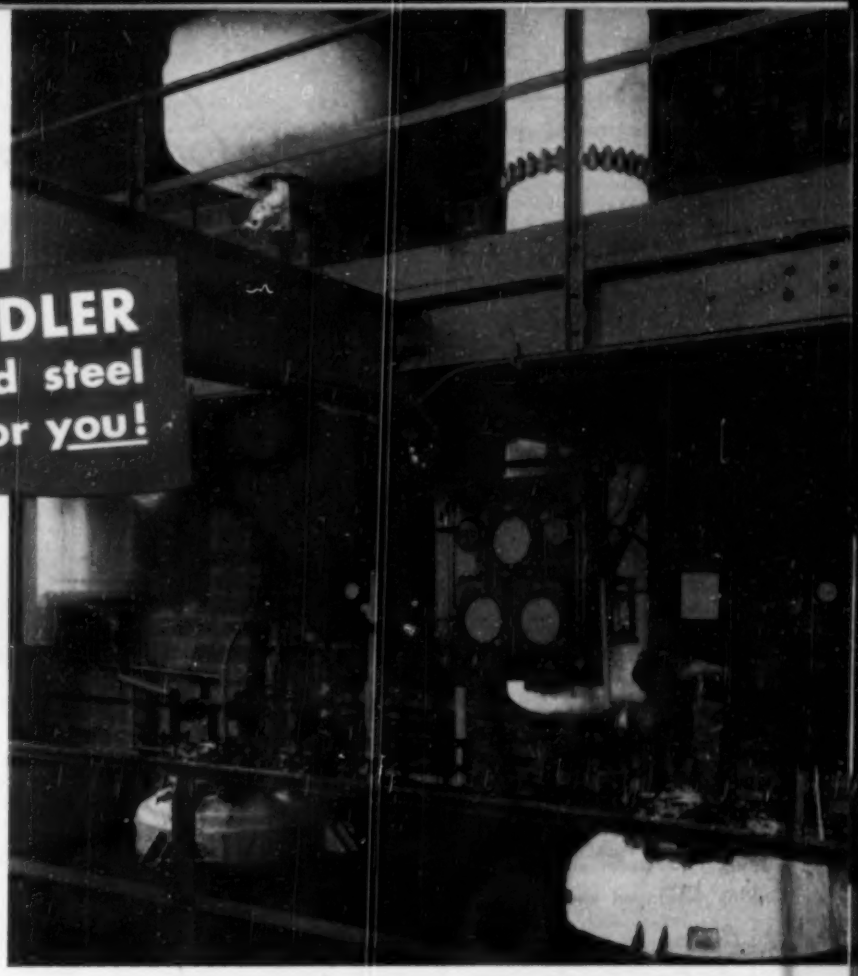

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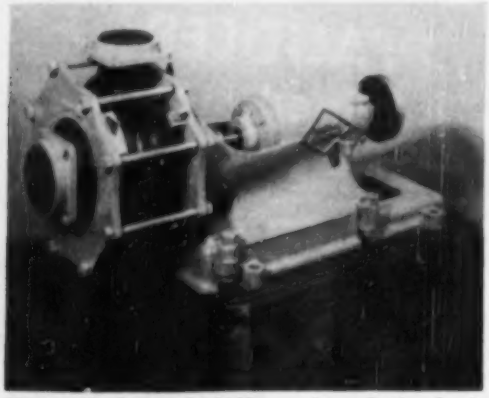
Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor

This special fitting molded of the same resins used in Kemplas equipment is undamaged after four years in aqueous HF.



This centrifugal pump for highly corrosive applications has its volute, impeller and gland cast from Kemplas resins.

Broad Line of Resin Equipment Introduced in Cold Cast and Laminated Types

General Ceramics now fabricating equipment from synthetic resins developed and tested 17 years by Penn Salt.

(140A) Under the name of Kemplas, General Ceramics is manufacturing a new line of chemical process equipment made of synthetic resins and designed to resist a wide range of severe corrosive conditions. The modified phenolic resins used were developed by Pennsylvania Salt Manufacturing Co. during 17 years of research and tests under severe conditions in the company's own plants, and in others. Equipment fabricated from these resins may be either cold cast or laminated with glass cloth and molded into desired shapes. Such equipment is suitable for operating temperatures to 350 deg. F., and it is resistant to virtually all except highly oxidizing acids. With certain modifications of the resin, equipment can be made to withstand definite concentrations of alkalis within certain temperature limitations.

Kemplas is light in weight, yet stronger than many construction materials. The cold cast form is particularly suitable for strong, dense castings where tensile strength is not especially important, as in pump volutes, impellers, and some pipe fittings. Laminated construction is used where extra strength is necessary, producing a material approaching metals in both tensile and impact strength. Cast pieces can be machined and threaded in the field and joined to one another by cementing with the same resin as the parent pieces. Laminated pieces can be field-cut by ordinary techniques, and methods have been developed to permit flanging and joining in the field.

Currently, Kemplas is being offered in a wide range of castings including Hills-McCanna valves, complete pumps, pipe fittings and cast vessels up to 30 in. in diameter, suitable for tower sections. Laminated equipment will shortly be available in rectangular and cylindrical vessels, and pipe up to 6 in. in diameter and 4 ft. in length. Shortly, a complete line, including reaction, absorption and storage vessels, valves, piping, fittings, pumps and miscellaneous chemical containers will be produced. Other suitable applications include electrolytic cell covers, fans, agitators, ejectors, nozzles, and linings for pipe and process vessels.

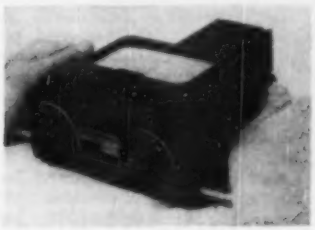
During the test period, Kemplas is said to have shown remarkable life in cases where other construction materials failed in short order. For example, pumps lined with Kemplas handled a combination of sulphuric and hydrofluoric acids at 160 deg. F. about 12 times longer than any special metal or alloy previously used.—*General Ceramics & Steatite Corp., Keasbey, N. J.*

MECHANICALLY OPERATED:

Vibrating Conveyors

(140B) Extremely simple construction is claimed for two novel vibrating machines, the Vibra-Feeder and the Vibra-Veyor, recently introduced by Robbins. In the first, or feeder, the vibrating mechanism consists only of four bearings and an eccentric shaft, driven by a small motor requiring less than 2 amp. In the second, or conveyor, two pan sections totaling up to 200 ft. in length are operated in opposite directions several hundred times per min. by a drive incorporating eccentrics, so that balanced operation results without extra counterweights. As in the case of the

feeder, considerably less power is required, it is claimed.—*Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J.*



REDUCES HAZARD:

Static Locator

(141A) Produced by Specialties, Inc., a new electrostatic voltmeter is available for locating and determining the amount of electrostatic charge on moving or stationary equipment in paper and other process industries. The instrument is simple to operate, light in weight, and has a high degree of sensitivity. Operation is from a flashlight cell which lasts six months.—*Specialties, Inc., Skunks Misery Rd., Syosset, L. I., N. Y.*

SENSITIVE, ACCURATE:

Oxygen Analyzer

(141B) Developed by Beckman under wartime secrecy restrictions, and only recently released for industrial use, is a new oxygen analyzer which operates without chemicals on a principal based on the paramagnetic property of oxygen. Oxygen has the unique property among gases of being attracted into a magnetic field. Most other gases are slightly diamagnetic. Oxygen is so strongly paramagnetic that it is possible to determine oxygen concentrations of only a few parts per million by measuring the magnetic susceptibility of the gas.

The instrument consists of a light dumbbell-shaped element made of two small hollow glass spheres supported on a quartz fiber. The spheres are free to rotate and are subjected to a magnetic force proportional to the difference between the volume magnetic susceptibility of the spheres and the gas which the glass spheres displace. Recording the rotation of the glass spheres is accomplished photoelectrically by a beam of light reflected from a mirror carried by the spheres. Any rotation causes unequal illumination between two photocells, creating an electrical potential which is amplified and recorded in terms of oxygen concentration. The instrument is adapted to such operations as remote indication and control and covers the entire range of oxygen concentrations from a few parts per million to 100 percent oxygen. Calibration is linear, and maximum accuracy is said to be secured over the entire scale.—*A. O. Beckman, Inc., 11 West State St., Pasadena 2, Calif.*

PISTON-TYPE:

Positive Meter

(141C) A new 2-in. meter for industrial liquids and petroleum products has been added to its line of Xacto meters by Bowser, Inc. This positive meter has five vertical pistons which operate a wobble plate geared to a horizontal track. All internal parts in contact with the liquid are either of a special hard carbon or stainless steel to eliminate metal-to-metal contacts at friction points. It is claimed that this construction permits a wide variety of liquids to be handled, many of which could not previously be handled due to dryness or corrosiveness. Maximum capacity is 110 gpm. for a maximum working pressure of 125 psi.—*Industrial Meter Sales, Bowser, Inc., Fort Wayne, Ind.*

MORE ACCESSIBLE:

Redesigned Motors

(141D) Redesign of its standard line of large, bracket-bearing, squirrel-cage induction motors has been announced by Allis-Chalmers. The result is better protection and greater accessibility for inspection and cleaning. The upper half of the bearing bracket can be removed for inspection and cleaning without exposing the inside of the bearing. Ample air-discharge openings in the side of the stator yoke, protected by removable

(Continued)

More Information . . .

To learn more about any item described here, circle the item's number on the Reader Service Postcard inside the back cover.

This Month . . .

Starting with this issue this department has been increased in space about 20 percent, compared with its maximum length in the past. Next month it will be increased again to a total of about ten pages, which is double the average for the past five years. As long as new equipment developments continue at the high rate they have maintained since the last war, and barring another paper shortage, you may continue to expect this expanded coverage. You've asked for it, the volume of new offerings justifies it, and here it is. Now back to a few of this month's features: There is something new in flowmeters on p. 142, and new resin-impregnated glass-fiber tubing for handling corrosive fluids on p. 144. Look, too, for a new wrinkle in solvent recovery on p. 145, and a rather revolutionary split-roll conveyor on p. 146.

Next Month . . .

Next month's expanded fare will include several new instruments, among them a recording viscosimeter operating on a new principle; a ball mill which is a further development of the conical mill idea; and a smoke alarm system which with a single instrument affords protection over an area of as much as 200 x 30 ft.

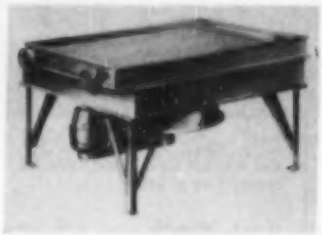
Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1950, p. 123.

Industry	June 1949	Mar. 1950	June 1950
Average of all	160.6	160.0	162.1
Process Industries			
Cement mfg.	155.9	155.5	158.1
Chemical	162.9	163.5	166.1
Clay products	150.9	150.5	153.1
Glass mfg.	154.0	153.6	156.2
Paint mfg.	157.2	156.8	159.4
Paper mfg.	157.6	157.1	159.7
Petroleum ind.	160.3	159.9	162.5
Rubber ind.	162.7	162.3	164.9
Process ind. avg.	161.4	160.9	163.5
Related Industries			
Elec. power equip.	165.5	165.1	167.7
Mining, milling	164.6	164.2	166.8
Refrigerating	174.8	174.8	179.4
Steam power	152.6	152.2	154.8

louvers, facilitate vacuum cleaning or blowing out the air passages behind the stator core. The standard design is drip-proof, but splash-proof motors with internal baffling of air passages are also available. The ventilating air intake and discharge openings, and internal passages in both the bearing brackets and the stator, are liberally proportioned to provide uniform ventilation and moderate air velocities for quiet operation. The new construction is standard in ratings up to 1 hp. per rpm. However, it also may be used in non-overloading industrial drives for ratings up to about 1.5 hp. per rpm. for motors in the high speed class up to 900 rpm.—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*



NO COOLING WATER:

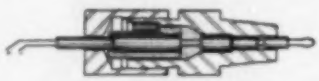
Dry Coolers

(142A) Three new blast coolers, known as Models L, M and JJ DriCoolers, have been announced by the Marley Co. The first two of these are small portable units, the first with the fan and tube sections mounted vertically, and the second (illustrated) with them mounted horizontally. In each there are seven sizes ranging from ½ to 4½ hp. on the fan. The third is an intermediate size horizontal cooler made in four sizes from 3 to 11 hp. These units are constructed of extended-surface copper tubing, cooled by a forced air draft. Designed to operate at pressures up to 150 psi. at 300 deg. F., they are suitable for cooling chemical solutions, refrigerants, gas, oils, and engine jacket water.—*The Marley Co., Fairfax & Marley Roads, Kansas City 15, Kan.*

REDUCES MAINTENANCE:

Packless Reducing Valve

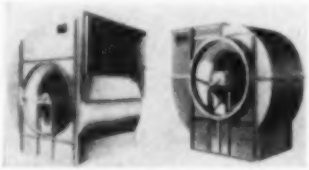
(142B) Substitution of a Monel metal sealing bellows for the usual packing has given advantages in longer life, lower maintenance and friction-less operation to the reducing valves made by C. E. Squires Co. The improvement applies to both pilot-operated and direct-operated valves produced in sizes up to 3 in. The new construction is said to eliminate sticking stems and to give added control to valves which already were capable of holding, within 1 oz. of the desired reduced pressure. This change has resulted in no change in external dimensions of the valves.—*The C. E. Squires Co., 18502 Syracuse Ave., Cleveland 10, Ohio.*



GIVES QUICK RESPONSE:

Thermocouple Gland

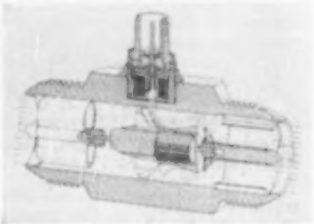
(142C) Conax Sales has introduced a bare wire thermocouple gland, known as the Conax, which enables any kind of thermocouple wires to be used for temperature measurement in closed vessels under pressure of gases, vapors, or liquids. Eliminating leakage, the device is said to give quicker response through the use of bare thermocouple wires. Wire is quickly and easily replaced if necessary. Sealing of the wires is accomplished by compressing dry powdered talc between two ceramic insulators to provide an electrical insulation which is virtually unaffected by either temperature or chemical reaction. Assembly requires only sliding the insulators into place, adding talc and tightening the cap. The device can be used at temperatures to 1,600 deg. F., and will withstand pressures up to 4,000 psi. Parts in contact with the material handled are of Type 304 stainless steel.—*Conax Sales Co., Box 72, Kenmore 17, N. Y.*



HIGHER EFFICIENCY:

Centrifugal Fans

(142D) After over two years of development work, Trane has announced the development of a completely new expanded line of centrifugal fans. The new fans are claimed to deliver air with as much as 23 percent less horsepower than other fans of the same rating. Intended primarily for air conditioning, ventilating and process applications, they are produced in both forward curved types in 21 sizes from 12 to 89 in. wheel diameter and in backwardly inclined types in 23 sizes from 12 to 109 in. wheel diameter. Each size is manufactured in both double and single widths. The improved performance characteristics and unusually low noise level are attributed to such special design features as streamlining of inlets, better proportioning of blade angles, depths and widths, scientific balancing of wheels, and the use of low outlet velocity. All fans are furnished with a corrosion resisting coating of chlorinated rubber base enamel. However, special metals and special coatings can be secured for corrosion-resisting applications.—*The Trane Co., LaCrosse, Wis.*



OPERATES ELECTRONICALLY:

Volumetric Flowmeter

(142E) Novel design which is said completely to eliminate end thrust in the rotating element is incorporated in the new Potter electronic flowmeter. The sensing element is a turbine type rotor spinning freely within a venturi. An Alnico permanent magnet within the rotor sets up a rotating field and generates a.c. current in a pickup coil. A single shielded wire conducts the a.c. current to an electronic unit which either integrates it into a.c. current for operating a rate-of-flow meter, or counts the number of cycles—proportional to the rotor speed—and totals the result on an electro-mechanical counter.

A novel feature of the design is the method used to achieve a balanced no-thrust operating position for the rotor. Fluid entering at *A* passes a stationary cone on the support, and a rotating cone of slightly larger diameter on the rotor, at *B*. The fluid then expands toward point *C*, passing through the turbine blades and turning the rotor. Owing to the venturi effect, there is a tendency to move the rotor upstream, but this is offset by impact pressure against the end of the rotor at *B*, so that a balanced position

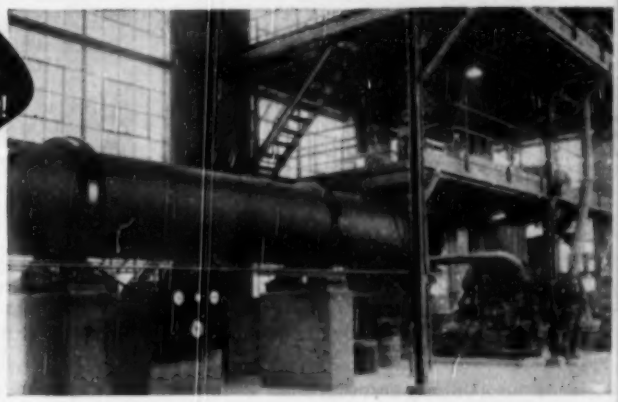
(Continued)

See Louisville for

CREATIVE DRYING ENGINEERING

Resin Producer Ends Contamination–Speeds Drying –Saves $40,000 A Year with Louisville Dryer

KNOW THE RESULTS before you buy!



FORMER DRYER

Installed cost $32,000
Drying time ..... 300 minutes
Drying cost ..... $1.42 per 100 lb.
(space required, 2,000 sq. ft.)

LOUISVILLE DRYER

Installed cost $78,000
Drying time ..... 25 minutes
Drying cost ..... $0.413 per 100 lb.
(space required, 900 sq. ft.)

YEARLY SAVINGS OF LOUISVILLE DRYER IN OPERATING COSTS ALONE . . . $40,000

Sometimes the cheapest drying methods are the most expensive!

Take the case of this producer of synthetic resin for plastics. His situation was studied by a Louisville engineer who uncovered this fact: by investing *more* money in a Louisville Dryer—especially designed for the job—savings would more than write off the cost of the new equipment in less than 2 years. In addition, total enclosure of the material to be dried would mean no contamination from airborne dust, dirt. Speeded-up drying time improved product quality.

Tests in our own research laboratories and pilot plant predetermined the performance of this custom-built dryer. Have a Louisville engineer survey your drying methods. No obligation. Write today.

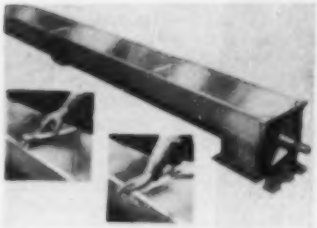
Ask for new treatise on subject of rotary dryers

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Towers, Tanks, Bins, Filters, Pressure Vessels

Louisville Drying Machinery Unit
Over 50 years of creative drying engineering
GENERAL AMERICAN TRANSPORTATION CORPORATION
Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street Louisville 2, Kentucky
General Offices: 135 South La Salle Street, Chicago 90, Illinois
Offices in all principal cities

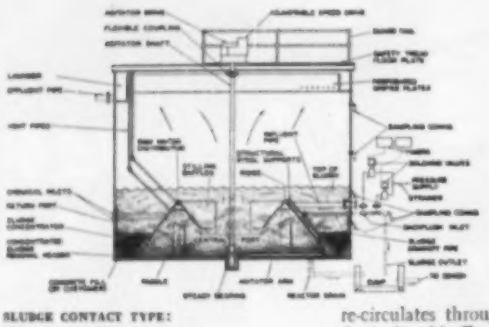
is achieved. Thus, no thrust bearings are required, and with fluid from the line admitted into each bearing through a small vent, the rotor is said actually to revolve on a film of liquid.

These metering elements are made in sizes from ¾ to 3½ in. in diameter, for operating temperatures from 4 deg. F. abs. to 1,000 deg. F., and for pressures up to 5,000 psi. in standard housings, or 20,000 psi. in special housings. Such meters can handle liquids or gases, and can be built to handle extremely corrosive conditions. Since they measure volume rather than weight, readings must sometimes be corrected for density variations if weight rate of flow is required.—*Potter Aeronautical Co., 87 Academy St., Newark, N. J.*



SEALS CONVEYOR BOX

(144B) A very simple time-saving device for sealing covers to screw conveyor boxes has been developed by Screw Conveyor Corp. The clamp snaps on about every 5 ft., eliminating use of bolts. With the clamp is a new U-edging which fits over the cover and box flange. The result is a dust-tight seal without tools or bolts.—Screw Conveyor Corp., Hammond, Ind.



SLUDGE CONTACT TYPE:

Water Treater

(144A) Utilizing the sludge contact principle to accelerate the reaction of raw water with treating chemicals, Cochrane Corp. has introduced the Cochrane-Liquon sludge contact reactor for handling any of a wide range of cold water treating processes including clarification of surface waters, lime or lime-soda softening, coagulation and reduction of alkalinity, removal of silica, fluorides, iron or manganese, and recovery of fiber stock from paper mill waters.

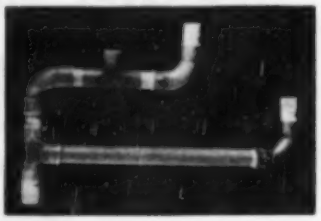
The illustration shows a cylindrical steel unit, although similar principles can be applied to cylindrical wood or concrete units, or rectangular concrete units. Raw water and treating chemicals are introduced together beneath the ridge of a baffle which separates the tank into two zones. Flowing downward into the mixing zone the water and chemicals are mixed by an agitator with recirculated sludge which speeds the reaction and produces a well-defined floc. The slurry flows upward through the central port past stilling baffles which stop its rotation. Slurry then moves laterally, with sludge settling into the concentrating zone and clear water flowing upward and out the discharge launder. Most of the concentrated sludge re-circulates through a return port in the inclined baffle, while the remainder is withdrawn at automatically controlled intervals through a diaphragm valve. Back-washing of the sludge discharge pipe to prevent plugging usually precedes the sludge withdrawal step.—*Cochrane Corp., Philadelphia 32, Pa.*

ACCURATE, AUTOMATIC:

Batch Integrator

(144C) By adding a photoelectric pickup and a predetermined reset counter to its standard electrical flowmeter integrator, Republic Flow Meters has produced an instrument for automatically making or breaking an electrical contact when a desired amount of fluid has been metered. This enables batching operations to be conducted accurately. The electric counter is set for the desired quantity and the process started by depressing a momentary-contact button which energizes a pump circuit or other apparatus starting the flow of fluid. The flow is measured with a Republic electric flowmeter and the flow integrated with a watt-hour type of continuous electric integrator. A multiface mirror on the integrator shaft reflects light from a light source on to a photoelectric cell connected through an amplifier to the electric counter. Thus, when the integrator has made the desired number of revolutions, the counter will operate to stop the pump and reset itself for the next batch.

Among advantages of the new integrator is the possibility of eliminating the use of a batch or immediate tank, enabling the desired quantity of fluid to be pumped direct to the process. Saving in time is also possible through eliminating batch measurement.—*Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill.*



GLASS-LAMINATED:

Plastic Tubing

(144D) Plastics Division of United States Plywood Corp. is now marketing Glasweld, a plastic laminated tubing formed of glass cloth, mat or tape molded together with various resins. Usually these are of the polyester type. Two types of fabrication are used, the convolute type made by wrapping resin-treated cloth around a metal mandrel; and the spiral type, made by wrapping a resin-treated glass tape spirally on a metal mandrel. The first type has equal strength in both longitudinal and circumferential directions, while the second has a circumferential bursting strength twice the longitudinal. The latter type is most used for tubing applications.

The company has also developed plastic fittings, using the same basic materials. Joints can be made by threading; by tapering and cementing; or by using plastic flanges bonded at the point of installation.

The new tubing is said to have a strength-weight ratio in excess of any other material, including metals, and a better impact resistance than most metals. It can be used to 275 deg. F. continuously, or up to 425 deg. F. for limited time-strength applications. The tubing is resistant to many chemicals, including certain concen-

trations of acids, aromatic and aliphatic hydrocarbons, and fuels. Tubing is produced in diameters from ¼ to 6 in. in the convolute type, and up to 12 in. in diameter in the spiral wrapped type, with lengths up to 30 ft. Fittings are currently made in sizes from 1 to 6 in.—*Plastics Div., United States Plywood Corp., 55 West 44th St., New York 18, N. Y.*

ADDS VERSATILITY:

Improved Gas Mask

(145A) Designating it as No. 6, Acme Protection Equipment Co. has announced a new gas-mask face piece which enables chin-style, chest-style and hose mask connections to be made to the same mask, thus eliminating the need for a different face piece for each service. The new mask retains the full-vision feature and other innovations regularly found in this company's products.—*Acme Protection Equipment Co., 3037 West Lake St., Chicago 12, Ill.*

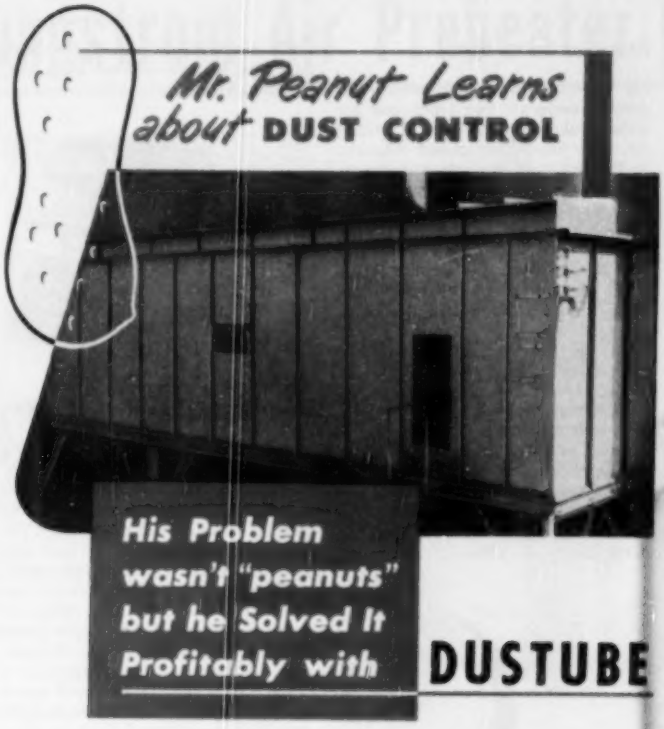
LOW-COST OPERATION:

Solvent Recovery System

(145B) To enable users of both water-soluble and water-insoluble solvents to effect solvent recovery at lower-than-average costs, Patterson Foundry has developed the Patterson-Pittsburgh solvent recovery system. The system uses bituminous activated carbon manufactured by Pittsburgh Coke & Chemical Co. The equipment is fabricated and installed by Patterson. Savings are possible, it is claimed, because equipment cost is lower, while the activated carbon used is much less expensive than vapor adsorption carbons derived from expensive raw materials. In addition to reduced investment cost, lower operating cost is also claimed.

Recovery systems are designed for all types of solvents and can be completely automatic, semi-automatic, or manual, as desired. Sometimes it is possible to revamp certain pieces of existing equipment with a correspond-

(Continued)



Dust was creating a problem in the No. 3 Raw Peanut Shelling Plant of Planters Nut and Chocolate Company, originators of the trademark "Mr. Peanut." Silica dust and fibre from peanut hulls, escaping from shelling operations, was permeating the atmosphere. It penetrated working mechanisms of machinery, causing breakdowns and excessive maintenance.

A Dustube Collector was installed to eliminate this nuisance at four peanut shelling stations which were the worst offenders. Working conditions improved immediately as the Dustube removed the dust with virtually 100% efficiency. Machinery maintenance costs were slashed. The collected dust—more than two tons weekly—serves a useful purpose as an excellent fill-in material.

Is dust raising your production costs? Let AMERICAN engineers check your plant and show you how they can improve the efficiency of men and machines and increase your profits. They will make recommendations without obligation, regardless of the size of your plant or the industry you serve.

Write today for complete information.

American
WHEELABRATOR & EQUIPMENT CORP.
347 S. Byrkit St., Mishawaka, Indiana

dustube COLLECTORS

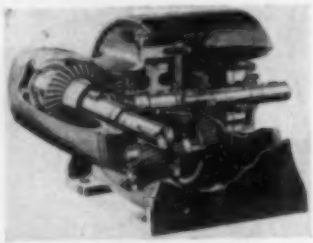
ing reduction in initial outlay. In general, there are two types, one for water-insoluble solvents and the other for water-soluble or mixed solvents. In the first type, the solvent-laden air passes through a filter cooler to adjust its temperature, then through one of two adsorbers, while the other is being steamed out. The solvent-steam mixture is condensed, the solvent decantered and, if necessary, revaporized and recondensed to remove plasticizers or moisture.

In the second type the setup is similar, except that a continuous distilling column is added for separating solvent and condensed steam. In general, it is claimed that if solvents are present in air at a concentration of 0.2 percent or more by volume, they may ordinarily be recovered at a cost of from ¼ to ½ c. per pound.—*The Patterson Foundry & Machine Co., East Liverpool, Ohio.*

RECORDS REMOTELY:

Weight Printer

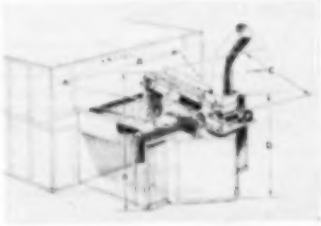
(146A) For use in conjunction with its Tape-Drive dial scales, the Howe Scale Co. has developed the Teleprint, a weight recorder and printer which can operate at distances up to 500 ft. or more from the scale site. The device incorporates three components, a take-off unit mounted as a part of the dial housing; a servo-amplifier, and a recorder unit remotely connected to the take-off by cable. These units are said to add no friction to the dial mechanism and to weigh and print only when the scale is in balance. The system can be remotely operated if desired, and can be used for drop-weight integration. Individual weights can be recorded and identified on a tape, while up to seven ticket copies can be produced at one time on standard weight stock. The device is applicable to automatic weighing applications in which the arrival of the load on the scale sets the device in operation so that it will print automatically when the scale comes to balance.—*Howe Scale Co., Rutland, Vt.*



CONCENTRIC OR ANGLE:

Improved Speed Reducers

(146B) Two new lines of all-steel speed reducers have been announced by the Falk Corp. One is a concentric shaft type, with input and output shafts on the same line. The other, a development of the first, adds another reduction stage at right angles to the output end of the concentric reducer. The concentric type, designated as Type C, is suitable for input speeds up to 1,750 rpm., or higher if necessary. The angle type, designated as Type CB, is suitable for input speeds to 1,750 rpm. The first is available in a ratio range from 1.5 : 1, to 970 : 1, while the second is made in a ratio range from 5.7 : 1, to 515 : 1. Both are produced in horsepower ranges from 1 to 50 hp., and for both the mechanical efficiency is claimed to be in the range of 96 to 98½ percent at full load, depending on the number of gear trains. Both types employ heat-treated alloy steel gears with precision cut and shaved teeth, together with a full complement of anti-friction bearings, and improved lubrication. — *The Falk Corp., Milwaukee 8, Wis.*



READILY ADJUSTABLE:

Dryer Feeder

(146C) Hydraulic power is used to operate a new oscillating feeder recently developed by Proctor & Schwartz for distributing loose, flaky, or granular materials evenly and uniformly across a wide dryer conveyor. Use of hydraulic power gives simple and accurate control of the speed and travel of oscillation, permitting smooth reversal at controlled rates. The use of the new feeder is said to insure an even load of material on the main conveyor, both from side to side and along the length of travel.

The conveyor consists of a hopper which receives material from the feed chute and deposits it on an oscillating feed belt. Oscillation is about a fulcrum beneath the feed chute. Below the conveyor, within the streamlined cover of the supporting stand, is a self-contained pump unit, hydraulic cylinders, and other controls for the equipment. The arrangement is extremely flexible. Dimensions labeled *A, B, C,* and *D* may be varied readily to suit the needs of each installation. —*Proctor & Schwartz, Inc., 7th St. & Tabor Road, Philadelphia 20, Pa.*

FOR CONVEYING:

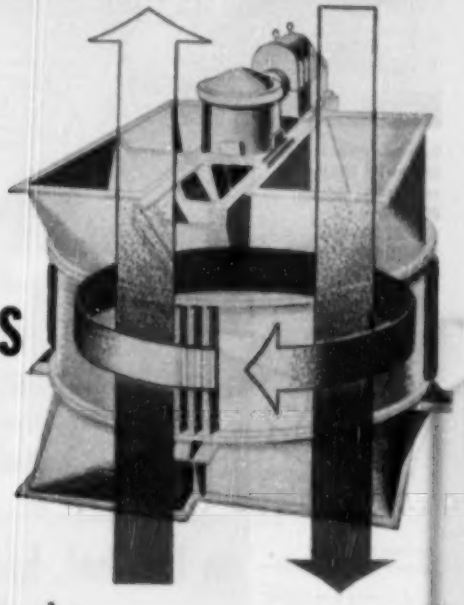
Self-Centering Roll

(146D) A conveying device which, although still in the experimental stage, may have an important influence on the materials handling field, has been announced by Carnegie-Illinois Steel Corp., largest subsidiary of United States Steel Corp. This device is a self-centering roll invented by E. T. Lorig, chief of the senior engineering staff of Carnegie-Illinois. Fundamentally, this device is a slightly crowned roll cut transversely in the center. The two halves are fixed to rotate as a unit with their working surfaces approximately horizontal, but with the axes at an angle. In this way, the planes or lines of force in both halves twist evenly toward the center in the direction of movement, conferring a self-centering action on any material passing over the rolls. Thus, side guides become unnecessary in keeping material on the conveyor.

A particularly good example of the

(Continued)

How the Ljungstrom Air Preheater can modernize "middle age" boilers



The lightness and compactness of the Ljungstrom Air Preheater makes installation possible on "middle age" boilers with minimum change in the existing structure. This addition of the Ljungstrom Air Preheater, with its continuous regenerative counterflow principle permits operation at lower exit gas temperatures . . . assuring increased heat recovery and reducing the amount of fuel required.

In a matter of a few years the Ljungstrom Air Preheater will effect savings that will more than offset the initial installation cost. If you are interested in approaching modern performance standards with your "middle age" boilers, our engineers will welcome the opportunity to show you how the Ljungstrom can raise the overall efficiency of your plant.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Huge Rotary Kiln in the Jacksonville, Florida, paper mill of the **NATIONAL CONTAINER CORPORATION**

they say:

"We use **This Lubricant** on big, hot, heavy bearings, too!"

Following is an extract from a lubrication report made by the plant engineer at the Jacksonville, Florida, Plant.

7' diameter by 300' long lime kiln, supported by five sets of trunnion rollers.

Temperature inside kiln at hot end is approximately 1800° F.

Kiln turns at approximately 1 RPM, trunnions turn at approximately 3 RPM on 7" journals in sleeve bearings lubricated by LUBRIPLATE No. 8.

Since changing to LUBRIPLATE No. 8 two years ago, wear on all bearings and journals has been reduced to a minimum, where formerly a definite problem of lubrication existed.

It is in these unusually severe applications where LUBRIPLATE Lubricants dramatically prove their outstanding qualities. Probably more seemingly impossible lubrication conditions have been satisfactorily met with LUBRIPLATE in the past twenty years than by any other group of lubricants.

In most instances, LUBRIPLATE Lubricants have been introduced to solve a difficult lubrication problem. Their performance is so remarkable that their use is extended throughout the plant. They definitely reduce friction and wear, prevent rust and corrosion and save power.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases . . . a product for every lubrication requirement. Let us send you case histories of their use and savings in your industry. Write today.

LUBRIPLATE DIVISION
Fiske Brothers Refining Company
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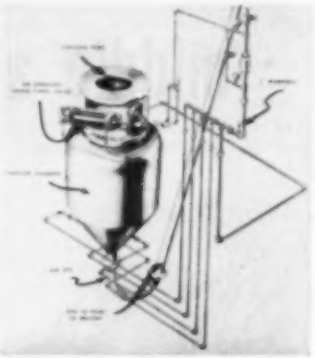
LUBRIPLATE ***THE MODERN LUBRICANT***

NEW EQUIPMENT, cont. . .

self-centering action is shown in the illustration above where pencils placed askew and off-center on the rolls of the model are quickly drawn into the center and thereafter will remain in that position. The new rolls are being made at the company's Johnstown works and have already been used successfully in several applications as roll conveyors and belt conveyors. For example, stainless steel belts for the handling of hot materials run successfully on such rolls, completely without the use of side guides.—*United States Steel Corp., 71 Broadway, New York 6, N. Y.*



HANDLES BULK MATERIALS:

Pneumatic Conveyor

(148A) Crane Co. is now offering the Turbo-Drive pneumatic conveyor, a device which it has been using in its own plants for several years. The conveyor operates on air pressure and consists of an entrance or swing check valve through which the material to be transported is loaded into a pressure chamber. Air pressure is controlled by a manifold incorporating several valves and a pressure regulator. When the chamber has been loaded, air pressure can be built up to deliver the batch to a suitable discharge point. A ton or more material can be moved in a few minutes. An entire system for batching various granular, crushed or pulverized materials can be controlled by a single operator located at a storage or mixing point. Dispatch to several locations is possible through the use of a transfer switch.

This conveyor is made in three sizes, of 7, 15, and 30 cu. ft. capacity of the pressure chamber. Tests have indicated that 1 cu. ft. of air will deliver about 3 to 4 lb. of materials similar to sand. Installation cost is said to be low compared with other conveying methods, coupled with sim-

plicity of design and lower maintenance cost.—Crane Co., 836 South Michigan Ave., Chicago, Ill.

TIGHTER, LONGER LIVED:

Swing-Gate Valve

(149A) Known as the Swing-tite, a new valve introduced by Jenkins has ball-and-socket design double disks which are said to adjust readily to the seat surfaces. In the illustration *A* on these disks represents the guide rims which rotate freely on the guide tracks *B* cast in the body as the gate opens or closes. This roller ac-

(*Continued*)

BETTER FILTER

(149B) Better respirator protection against both dangerous and nuisance dusts is claimed for a new wool felt filtering material recently patented by American Optical Co. Wool felt is first impregnated with a resin in an organic solvent, then irradiated by infra-red. The chemically treated felt is then further activated by mechanically fracturing the resin film coating the fibers. Interestingly enough, it has been found that both impregnation and mechanical breaking are necessary to develop full effectiveness. It is believed that the chemical and mechanical treatment induces electrostatic charges in the wool fibers and their attached resin fragments. These charges then attract charged dust particles. — American Optical Co., Southbridge, Mass.

Only 3 MOVING PARTS in the HENSZEY Indicating FLOW METER

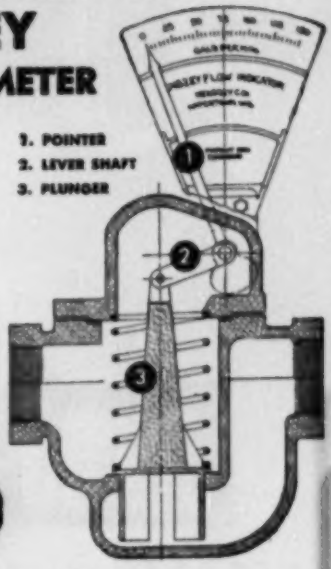
Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

For Details Consult Sweet's Catalog or Write

HENSZEY COMPANY
Dept. ETB, WATERTOWN, WISCONSIN



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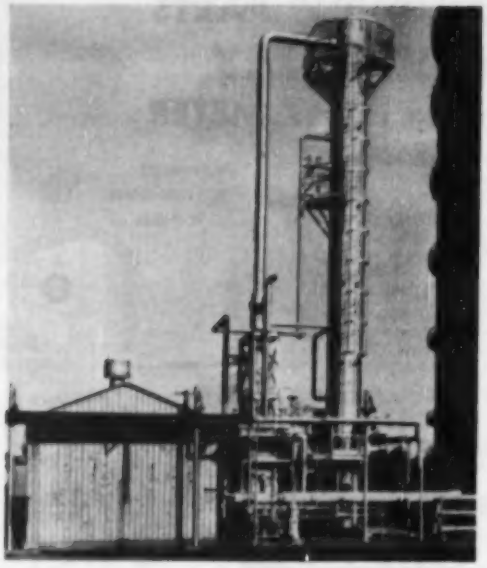
Indicating FLOW METERS

Continuous Blowdown • Distillation System • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS



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With Blaw-Knox, small projects receive the same engineering care as do large ones. Each problem is a matter for careful consideration by a separate department employing engineers of broad general experience. This group can handle a small job much more economically, because there is no overlapping or duplication of effort.

When satisfied that designs and specifications exactly meet the customers' needs, our field construction force builds the plant in minimum time and turns it over "on stream." Glad to show you some interesting figures on our Gasoline Stripping Plants and related projects for the gas and oil industry.

OIL and GAS DEPARTMENT

CHEMICAL PLANTS DIVISION

BLAW-KNOX CONSTRUCTION CO.

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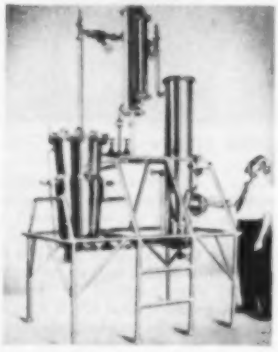
tion is said to provide a self-cleaning and polishing effect, also distributing the wear. The valve, which is of the quick-opening type, is rated for 125 lb. steam service, or 300 lb. cold oil, water, and gas service. It is made in ½ to 2 in. sizes, particularly for use in oil refineries, chemical and paper industries and similar applications.—*Jenkins Bros. Co., 100 Park Ave., New York 17, N. Y.*

FOR GENERAL SERVICE:

Venturi-Ball Valve

(150A) Designed especially for throttling applications in high-pressure, corrosive or erosive service, is a new venturi-ball valve offered by the W-K-M Co. In the throttling position the ball is said to present a smooth surface, making non-turbulent

(*Continued*)



EXTRACTS BOTANICALS

(150B) This Lloyd extractor apparatus, used for extracting roots, herbs, seeds, etc., is a recent installation produced by Brighton Copper Works as a production size model. It is fabricated of solid stainless steel throughout, with a No. 4 polish inside and out.—Brighton Copper Works, Inc., Cincinnati, Ohio.

WeldELLS®

...There are no fittings like WeldELLS

When we say there are no welding fittings like WeldELLS we feel that we are simply repeating the expressed opinions of thousands who know pipe welding.

Often it is the opinion of a designer who recognizes the engineered strength distribution and closely controlled metallurgy of these fittings that are designed by engineers.

Frequently, it is the opinion of a construction superintendent, maintenance man, or welding foreman who has discovered job-speeding, cost cutting features in WeldELLS that are combined in no other fittings.

Sometimes it is the opinion of those whose unusual requirements can only be satisfied in the broader Taylor Forge line; for in certain sizes, weights and materials it can be truthfully said that *there are no fittings* BUT *WeldELLS!*

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KEEPS AIR "SPRING CLEAN" AT ARMSTRONG CORK CO.

Enclosed dustproof inclined conveyor with outlet to Pangborn Collector

Glass batch mixing and conveying had always been a slow-down operation at the Millville, N. J., plant of Armstrong Cork Co. Fine abrasive dust filled the air, wasting materials and creating unpleasant working conditions for both men and equipment.

When Armstrong engineers designed the new glass batch plant, dust control was naturally included. Now, dust-tight conveyors, hoppers and elevators with PANGBORN DUST CONTROL keep the plant air clear and fresh. Batches are mixed and delivered uncontaminated. Better working conditions have produced top efficiency from both men and equipment.

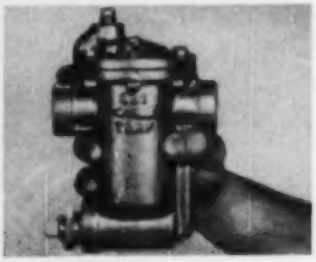
Perhaps dust control might also increase your plant efficiency —save money, time and materials. Find out now . . . a free Pangborn Dust Survey costs you nothing, and involves no obligation. Write for Bulletin 909A to: PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

STOP THE DUST HOG from stealing profits with

Pangborn DUST CONTROL

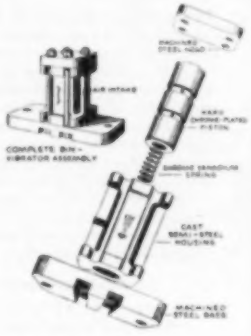
flow possible over a wide range without erosion. With wide-open flow, the ball is out of the way and the flow is non-turbulent, non-obstructed and suffers negligible pressure drop. When tightly closed, the ball seats tightly regardless of pressure and flow conditions, line contact between ball and seat giving tight shut-off. The ball rolls on opening or closing, thus making the valve easy to operate even under adverse conditions. — *W-K-M Co., Houston, Texas.*



BUILT-IN STRAINER:

Bucket Steam Trap

(152A) Under the designation of 881, Armstrong has added to its line another small inverted bucket steam trap equipped with a brass strainer built into the body. This is a side-inlet, side-outlet trap for draining small equipment. Because small traps have small discharge orifices, a built-in strainer is particularly advantageous when dirt and scale conditions are bad. The new traps costs less than a comparable standard trap plus a separate strainer.—*Armstrong Machine Works, Three Rivers, Mich.*

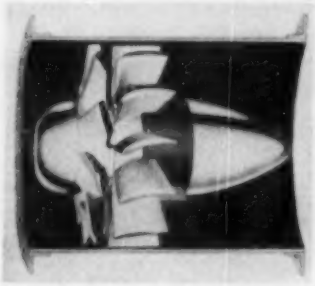


SIMPLIFIED DESIGN:

Air-Operated Vibrator

(152B) Redesign of its Type F air-operated vibrator has enabled the Cleveland Vibrator Co. to reduce the major parts to five components, in

contrast to other vibrating units having as many as 50 parts. This simplification is said to reduce maintenance, minimize wear, and make operation easier. As the illustration shows, the unit consists of a mounting base, a housing, spring, piston and head held together by four body bolts. The unit is used to prevent plugging and arching in chutes, hoppers, bins, screens or storage tanks.—*The Cleveland Vibrator Co., 2866 Clinton Ave., Cleveland, Ohio.*

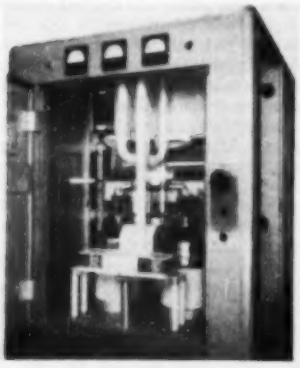


QUIET, EFFICIENT:

Axial Fan

(153A) Two new axial-type, medium-pressure ventilating fans, to which the name Vaneaxial has been given, are announced by Robbins & Meyers. As the cross-section shows, the axial fan employs steeply pitched blades, aerodynamically designed, with a high lift section at the root, and the

(Continued)

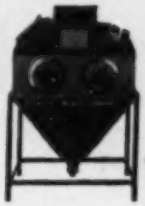


DIELECTRIC HEATER

(153B) RCA's newest dielectric heat generator, Type 15-CH, is a medium power unit for use in plastics, rubber, ravon, and similar applications. It is self-contained, developing a power output of 18-21.8 kw., and frequencies of 5.5 to 41 megacycles. It is self-contained and push-button operated.—Industrial Equipment Section, RCA Engineering Products Dept., Camden, N. J.

Which of these Machines will Save You Money ?

These factory-assembled units of Pangborn Blast Cleaning and Dust Control machines are especially designed to earn extra profits where special equipment is not required.



BLAST CLEANING CABINET

cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Ideal unit for producing clean, smooth surface on pieces up to 60" x 36".

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BLAST CLEANING MACHINE

for maintenance and many other uses including the removal of rust, dirt, scale, etc. Economically cleans large objects such as tanks, bridges, structural work preparatory to painting. Six sizes, stationary or portable.

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traps dust at its source, minimizes machine breakdowns, reduces housekeeping and maintenance costs. Solves many grinding and polishing nuisances and material losses.

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HYDRO-FINISH CABINET

uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001".

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PORTABLE MIXERS—*Precision Built. Electric or Air-Motor Drive.*
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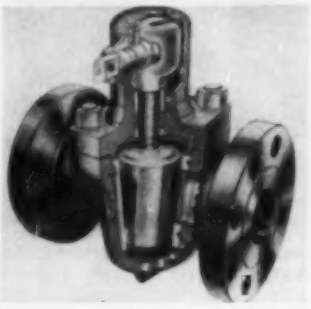
DRY BLENDERS—*All Types, from 2 to 300 cu. ft.*

blade reduced toward the tip to provide uniform discharge velocity over the entire blade area.

To prevent swirling and provide a smooth, efficient axial flow of air, guide vanes are installed directly behind the propeller. This construction is said to reduce power input and to operate quietly over a wide pressure range. Units are produced for 20- and 24-in. diameter duct systems, with an internal direct-drive motor used for non-hazardous applications, or an external belt-drive motor for installations involving corrosion or combustion hazard.—*Propellair Div., Robbins & Myers, Inc., Springfield 99, Ohio.*



LUBRICATION NOT NEEDED:

Lift-Plug Valve

(154A) After nearly ten years of development and field testing, Cameron Iron Works has announced a new non-lubricated valve known as the LP (Lift-Plug) type. This valve has various novel features, including a new plug-lifting and rotating mechanism which operates with one continuous turn of the operating lever through three-quarters of a revolution. Larger valves and those for higher pressures use a handwheel and three-to-one reduction. In opening, the plug is first lifted from its seat without rotation, then turned, then reseated without rotation, all in one continuous movement. Since the plug is free when turned, lubrication is not required for this reason. Nor is it required, it is claimed, to effect a seal if distortion prevents full contact between the sealing surfaces. The reason for the latter is that the seat is separate from and not attached to the valve body so that the seat is pressed firmly against the plug as the line pressure is increased.

As a result of these features, the valve is claimed to be rugged and simple in construction, withstanding severe service conditions and operating readily at all pressures. Little or

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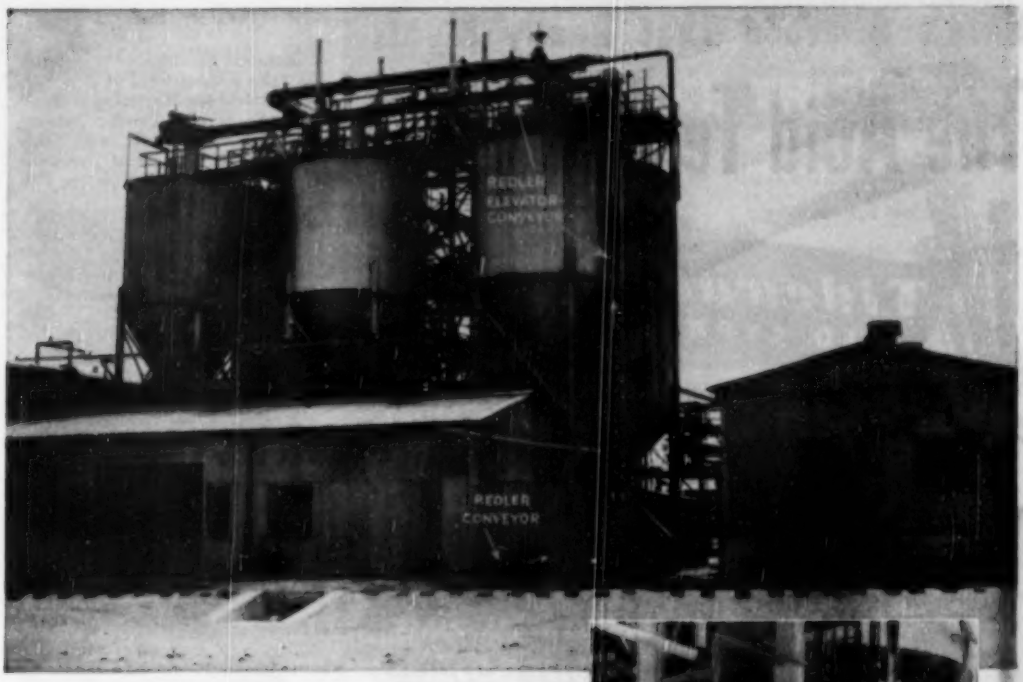
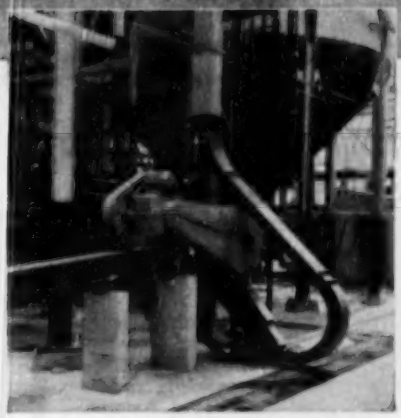


Keeping Their Powder Dry

Absorption of too much moisture causes lime, soda ash and magnesium oxide to cake. Because of its sealed, weather-tight casing, the REDLER elevator-conveyor proved to be a practical answer to the needs of this Louisiana plant where high humidity prevails. In providing a smooth, trouble-free flow of materials in spite of atmospheric conditions, the REDLER with its enclosed feature also avoids spillage of materials and prevents contamination.

This installation is typical of the many special-purpose, individually "tailored" materials handling systems that S-A engineers have been designing for nearly half a century. This cumulative experience has contributed to constant improvement in methods and equipment.

In working out your handling problems, you can draw on the experience of S-A engineers in practically every type of industry. In this way, you assure maximum handling efficiency at lowest cost per ton—particularly where difficult conditions exist. Write today.



CIT-CON OIL CORPORATION
LAKE CHARLES, LA.

Water-treating chemicals are picked up from under a small truck hopper by a horizontal REDLER conveyor, 54 feet long, and conveyed on a slight incline to a transfer point. There the loop-boot REDLER elevator-conveyor receives and elevates them up the side of a 50-foot high storage tank. Materials are then conveyed horizontally for 54 feet over three adjacent storage tanks, where they can be discharged through gate-controlled chutes into the desired storage tank. This REDLER system is geared to handle from 5 to 7 tons per hour and is self-cleaning.

STEPHEN S-A ADAMSON MFG. CO.

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DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

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The "Acid Test"

For Maximum Service with Minimum Maintenance!

One of the country's leading chemical plants installed a Tidewater Red Cypress acid washing tower (illustrated above) many years ago. They report that this tower has given outstanding service through the years with exceptionally low maintenance costs.

Exhaustive tests by several Government Agencies show that Tidewater Red Cypress is particularly resistant to the action of common chemical solutions. This wood also imparts neither taste, odor nor color to materials brought into contact with it . . . a valuable asset to many chemical plants.

For tanks, vats, stocks, cooling towers, etc., use Tidewater Red Cypress . . . the Wood Eternal.

If you have perplexing problems, large or small, let us help you solve them. No obligation, of course.

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For experimental laboratories, pilot plants and exacting small scale operations, rugged American Laboratory Crushers provide controlled, *uniform* reduction of fibrous and friable materials—soft or hard.

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American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

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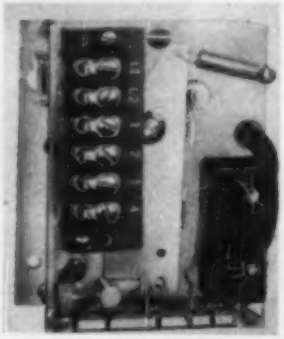
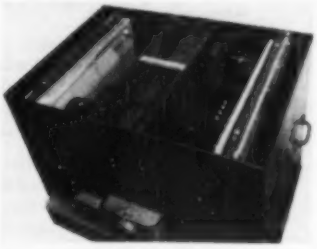
no periodical maintenance is required. The valve is constructed of steel forgings wherever possible, using as standard a 15 percent chrome stainless steel for plug and seat, with other trims available for special services.—*Cameron Iron Works, Houston, Tex.*



RESETS AUTOMATICALLY:

Delay Timer

(156A) Designated as Type 5600, a new delay timer with automatic, instantaneous resetting is being offered by Automatic Temperature Control Co. The timer is available in a complete line of standard ranges from 0.75 sec. to 30 min. It is driven by a Telechron motor and utilizes a tripping arm which is driven through a train of machine-cut spur gears and a snap-acting single-pole, double-throw precision switch which either opens or closes an auxiliary circuit. Resetting is instantaneous, accomplished by means of an electromagnetic coil which positively clutches and de-clutches a trip-locking gear as required. — *Automatic Temperature Control Co., 5212 Pulaski Ave., Philadelphia 44, Pa.*

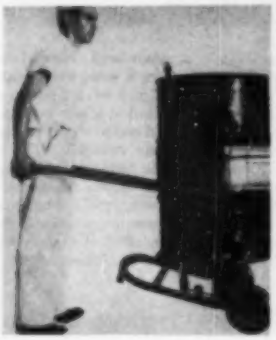


OPERATES AUTOMATICALLY:

Air Dryer

(156B) Made in three models, the Desomatic line of silica-gel air dehumidifiers is being offered by Daly, Merritt & Sullivan. The smallest model (Type SRR-8), for small spaces,

handles 25 cfm. of air and will remove 8.5 lb. of water per day at 80 deg. F. and 60 percent relative humidity. The intermediate model, Type SOR-8, was initially developed for Navy use for comparable capacity, but at lower dew points. Model DOR-38 is a two-bed unit handling 70 cfm. and producing relative humidities in the 50 percent range or below at capacities in the range from 20 to 38 lb. of water per day (depending on air conditions). The last mentioned model is the one shown in the accompanying illustration.—*Daly, Merritt & Sullivan, Inc., 935 Hughes Court, N.W., Washington 7, D. C.*



HOLDS, TILTS, CARRIES:

Portable Drum Rack

(157A) Penco Engineering Co. has developed a new drum rack available in both portable and stationary models. Both are similar, except that the portable model is equipped with rubber-tired wheels and is designed for perfect balance and fast handling of drums, while the somewhat lighter stationary model lacks the mobility of the former. Both types have a tilting and locking feature which assures easy tilting and holding of drums in any position for accessibility and maximum drum drainage. Both models, of welded steel construction, handle drums of 50 to 55 gal. capacity. Both types permit vertical storage of drums and reduce possible fire and accident hazards. In both the drum is securely fastened by positive toggle locks and a strong band which easily supports the weight of the loaded drum.—*Penco Engineering Co., 725 Second St., San Francisco 7, Calif.*

Squeeze Pumper

(157B) The novel Sigmamotor, announced originally on page 145 of our March 1946 issue, is now being made by E. & M. Enterprises and is useful for laboratory and semi-works

(Continued)

There's No Other Welding Tee LIKE THIS!

- Cold formed—seamless—by the exclusive Welding Fittings process.
- Full center to face dimensions.
- Annealed, cleaned bright and passivated.
- Smooth interior walls.
- Machine tool cut and beveled.
- Trademark, type of material, size, schedule, wall thickness marked.
- Reinforced crotch . . . tee is stronger than pipe with which it is used.
- Heat number permanently stamped as record of actual analysis and physical properties.

FLOWLINE stainless welding tees, ells, reducers, stub ends, and caps are available in sizes from ⅛" through 12". 2846 stock items—see Bulletin S-310.

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STAINLESS STEEL TYPES 304, 316, 347 • MONEL • INCONEL • NICKEL
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accurate—Inherent functional error cut to less than 0.1%. Optical system eliminates stray light with attendant error. Parts are locked in place to prevent misalignment.

simple—All adjustments made with a single control. You get instantaneous readings with amazing ease. Routine chemical analyses made in three simple steps.

rugged—Stays accurate under hardest usage. Compensated microammeter assures an unwavering reading at all times regardless of vibrations or other unfavorable conditions.

highly selective—Ten narrow pass band filters cover the spectrum from 415 to 640 millimicrons. Two blank spaces provided for special filters. All parts tested for conformity to exacting specifications.

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FOSTER FLOW TUBE

Gentle Patents

FIVE FEATURES

for your Consideration:

1 . . . Compactness Note in the picture above the short axial length. Tubes 3" in size and larger are approximately 1 to 1½ diameters long, depending upon the velocity in the main. For high main line velocities (above 10 ft/sec. for liquids) tubes are less than 1 diameter in length.

2 . . . Ease of Installation Due to its compactness and because it requires no straight runs upstream or downstream, except near valves or regulators, the total space required for installation is but a small fraction of that necessary for other primary devices. It can be installed as readily as a fitting and in that section of the line most conducive to steady flow conditions. Moreover, it can be installed in the plant proper, eliminating the need for expensive vaults or housing.

3 . . . Reversibility The Foster Flow Tube is symmetrical transversely; upstream and downstream nozzles and ports are identical. This means that where processing calls for flow reversal, the meter can readily handle the changes.

4 . . . Low Head Loss Where head losses are important Foster Flow Tubes are designed with a main-to-throat ratio that provides negligible unrecovered head losses.

5 . . . Accuracy All Foster Flow Tubes are furnished with calibration curves obtained in laboratory tests simulating installation conditions and can therefore be guaranteed to an accuracy to meet any specification.

Foster Flow Tubes are recommended for a wide range of services metering the flow of liquids and wet or dry gases. They are available in all commercial pipe sizes with flanged or screwed connections. Standard lining is bronze but other materials are available. In writing for further information, give processing and installation details of your metering requirements.

FOSTER ENGINEERING Company

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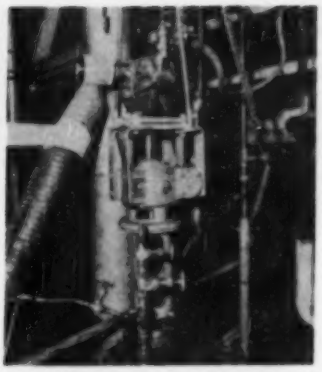

AIR-POWERED AGITATOR

(158A) A prominent New Jersey plastics manufacturer is using this variable speed agitator, powered by a Leiman air motor, for an application where both variable speed and freedom from possible explosion hazards are essential. The installation is used in research where agitation conditions and power requirements cannot always be anticipated. Merely increasing the air pressure permits higher viscosity to be handled.—Leiman Bros. Inc., 112-G Christie St., Newark 5, N. J.

NEW EQUIPMENT, *cont. . .*

pumping. The pumping element is a flexible tube against which a series of fingers bear in sequence so as to impart a positive unidirectional motion to fluid in the tube. At 475 rpm. capacities from 5.1 to 29.1 gph. can be obtained by varying the tube size. —*E. & M. Enterprises, Inc., Middleport, N. Y.*

Hard-Facing Electrode

(158B) EutecTrode 10 is the designation of a new hard-facing electrode of hardness of Rockwell C 63-68 which is claimed to be the first universal electrode for this purpose. The abrasion resistance is said to be exceptionable and yet it is claimed that application is easy and that any welder can apply it.—*Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.*

Polyethylene Coating

(158C) Houghton Labs has perfected a flame-spray process for applying polyethylene coatings to tanks, tank cars and process equipment, which results in thicknesses of $\frac{1}{16}$ to $\frac{1}{4}$ in. without use of solvents. The coating is said to be without pinholes or other defects and suitable for practically all chemicals or other corrosives. — *Houghton Laboratories, Olean, N. Y.* —*End*

ONE OF A SERIES DEMONSTRATING APPLIED LUKENOMICS

Heating Corrosive Crude?

...here's a tank that can take it

Vertical crude oil feed tank fabricated by Nooter Corporation for a large Western chemical producer. Type 347 Lukens Stainless-Clad Steel was selected because it gave the essential strength and protection for this highly corrosive application with maximum economy.

PROBLEM: *To heat highly corrosive crude oil economically prior to pumping to fractionator for further processing.*

EQUIPMENT: *Externally braced, welded vertical crude oil feed tanks of Type 347 Lukens Stainless-Clad Steel. Heat provided by internal steam coil of solid stainless steel. Tanks have sloping contours, with flued openings in end heads, for easy cleaning and maintenance. Inner stainless surface to resist corrosion; carbon steel backing and steel stiffening rings to insure rigidity and strength for vacuum operation, with maximum economy.*

END RESULT: *Economical heating of crude oil to proper temperature. Corrosion problem eliminated by equipment with low first cost and long service life. Maintenance costs reduced to a minimum.*

Here is another case of where the coordinated ingenuity of designer, engineer, fabricator and materials supplier provided the economical answer to an equipment problem. This was the result of applied *Lukenomics*. For Lukenomics combines the experience of equipment designers and builders with Lukens' knowledge of materials and their application, gained over 140 years as the world's leading producer of specialty steel plates, heads and steel plate shapes.

It's sound judgment to put Lukenomics to work on your equipment problems. There are progressive fabricators who can do this for you. Get in touch with them, or write our Manager of Marketing Service, stating your problem. Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

We'll be at the National Metal Exposition in Chicago; Oct. 23-27; Booth 1638. Our Technical Staff will be on hand to greet you and help answer your problems.

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Working together, these buyers and sellers of advertising have established standards for circulation values and a definition for paid circulation, just as there are standards of weight and measure for purchasing agents to use in selecting merchandise and equipment. In other words, A.B.C. is a bureau of standards for the advertising and publishing industry.

A.B.C. maintains a staff of specially trained auditors who make annual audits of the circulations of the publisher members. Information thus obtained is issued in A.B.C. reports for use in buying and selling space. All advertising in printed media should be bought on the basis of facts in these reports.

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- A breakdown of subscribers by occupation or business.
- How many subscribers renewed.
- How many are in arrears.

McGRAW-HILL PUBLICATIONS

A.B.C. REPORTS — FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE

ACHEMA Displays New German Equipment

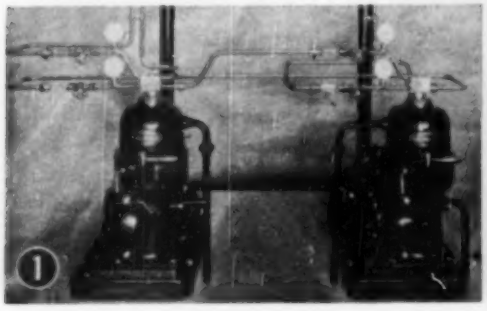
With this the first ACHEMA since 1937, John J. Christie of McGraw-Hill's Frankfurt Bureau combed the famed German Chemical Equipment show for the dozen leading new developments. Here is a chance to compare German and American equipment designs.

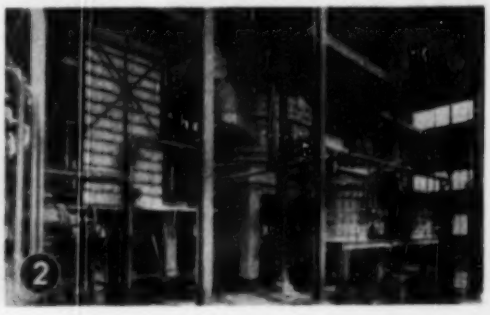
ACHEMA IX, ninth of the series of German Chemical Expositions held by the DECHEMA, or Deutsche Gesellschaft für Chemische Apparatewesen (German equipment manufacturers' association), was put on at Frankfurt/Main during July. First such show since 1937, it indicated that German equipment builders have staged a remarkable comeback. Foreign visitors were impressed by the quality of equipment displayed, by the relatively low prices, and by the short delivery times promised. Lower wages and unused plant capacity are largely responsible for these favorable price and delivery factors, since German equipment people are still short on domestic business and German industry is short of capital.

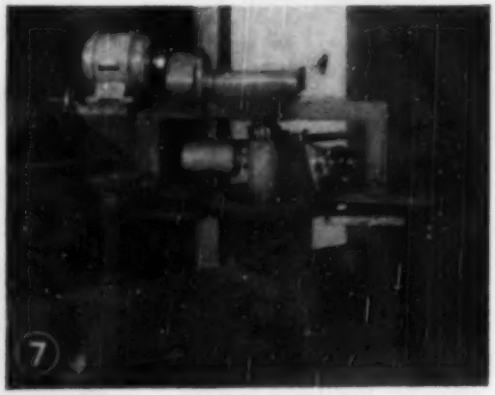
Exports also are lagging in western Germany, partly because German businessmen have been slow in re-establishing their contacts in world markets. The over-all chemical equipment picture has been dim, but is improving. In 1949 the sales stood at 47 percent of 1936 and at only 41 percent in the first quarter of this year. The second quarter was evidently considerably better, while the boost given by ACHMA is expected to continue the trend.

One of the most interesting of the new developments at ACHEMA was the Luwesta extractor shown in Fig. 1. This joint product of Lurgi, of Frankfurt/Main, and Westphalia Separator A.G., of Oelde/Westphalia, is intended for the extraction of liquids by solvents. It incorporates three stages within a single machine (although the smaller machines shown in Fig. 1 actually have but a single stage each). In effect, the principle may be described as consisting of mixing stages alternating with centrifugal separation stages. Construction of a three-stage machine is much like that of a disk-bowl centrifugal, with three separate groups of disks. The groups are separated by barriers, and internal connections are provided for mixing various of the light and heavy fractions produced so as to give countercurrent contacting.

Lurgi-Apparatebau-Gesellschaft mbH. also publicized a number of other developments, among them the latest version of its endless-belt filter. This device makes use of two endless belts travelling over two drums and carrying filter cloth. Filtration takes place over a suction box. Applications occur particularly among processes which produce crystals. Another Lurgi advance is an improved







system for removing arsenic from roaster gases used for sulphuric acid, involving the use of a single-stage wet purification, with electrostatic precipitators made of stoneware. Improved lead-lined precipitators (Fig. 2) have also come into the picture. Lurgi is now offering a new process for recovering SO_2 in pure form from weak waste gases, using organic bases are the absorbent.

Still another Lurgi development is the so-called flotation cooler shown in Fig. 3. It is suitable for drying all kinds of fairly fine solids, cascading them over a step-shaped grate through which hot gases ascend. The material is thus kept in semi-suspension.

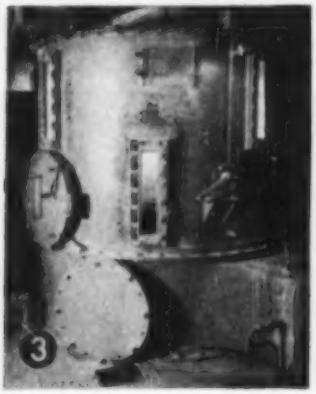
New equipment for weighing and materials handling was featured by Carl Schenck, of Darmstadt. The continuous weigher shown in Fig. 4 operates by varying the speed of the weigh belt to correspond with the load. Accuracy is claimed to be within about 1 percent. This same concern exhibited a new spiral-type vibrating conveyor for elevating solids, or for combination operations such as conveying while drying, cooling and screening.

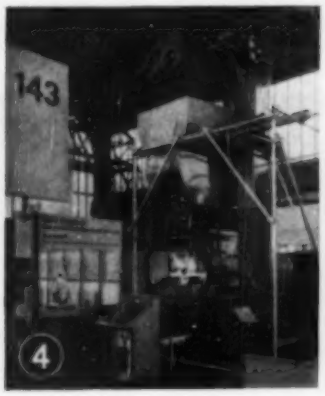
The Arbeitsgemeinschaft ACV, of Köln-Niehl, featured distillation and related equipment of Dr. Stage, Wilhelm Schmidding and Heckmann Apparate. One such new development (Fig. 5) is a reflux splitter for distillation columns. This device consists of a rotatable cylinder within a second concentric stationary cylinder. The annular space between is halved by two partitions attached to the outer cylinder and bearing on the inner. All the condensate enters the inner cylinder. The split between product and reflux is determined by what part of an opening in the inner cylinder wall is on either side of one of the partitions. The split can be varied by rotating the inner cylinder. In Fig. 6 is a new distilling column plate exhibited by the ACV firms, developed as a more efficient substitute for the conventional bubble-cap plate. Liquid enters from the plate above into the lefthand center compartment, flowing around the outside and into the downcomer in the righthand central compartment. Vapor from the plate below enters around the periphery of the plate through numerous slots below the liquid level, creating an extremely high degree of turbulence.

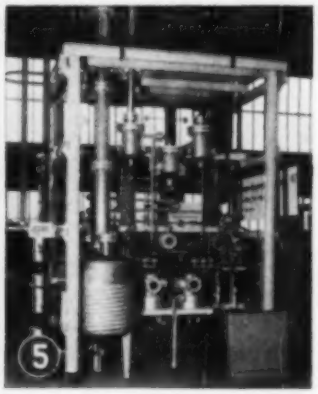
One novel exhibit of Matra Werke, Frankfurt/Main, is a portable tool for machining equipment flanges in place, especially for repairs. As Fig. 7 shows, it clamps on the flange and can be used for such operations as turning grooves for gaskets.

Carl Canzler, of Duren, showed an improved induction heating system for resin kettles which enables steam heat to be used up to the available steam temperature, with electric heat applied from that point on to the desired final temperature.

New precious metal construction materials were featured in the exhibit of Degussa-Siebert, of Hanau. Pallacid, an alloy of 30 gold, 30 palladium and 40 percent silver is said to be as resistant to strong mineral acids as fine gold. Furthermore, its specific weight is less. Cadag 604 is a silver alloy having a small percentage of cadmium, with four or five times silver's resistance to chlorine.







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New Products and Materials

JOSEPH A. O'CONNOR, *News Editor*

VERSATILE:

Organic Intermediate

(164A) Experimental quantities of *n*-methyltaurine, a versatile intermediate used as a building block for detergents, pharmaceuticals and many other organic chemicals, are now offered by the Industrial Chemicals Department, Antara Products, General Aniline & Film Corp.

Long a "captive" intermediate manufactured solely for General Aniline use, *n*-methyltaurine is sold to industry as an aqueous solution of its sodium salt. It is a valuable, low-cost intermediate with many interesting potentialities. Other taurine derivatives (butyltaurine, for instance) with many possible applications can also be made by the company.

The solution of the sodium salt of *n*-methyltaurine, CH_3-NH-CH_2-CH_2SO_3Na, is clear and colorless, with a freezing point of approximately −28 deg. C. It contains 34-36 percent by weight of the sodium salt, together with approximately 1 percent of free caustic soda. The sodium salt itself behaves as a weak base, and as such, will react with one equivalent of acid. Molecular weight of the sodium salt is 161.

By combining it with fatty acid chlorides, *n*-methyltaurine can be used in the manufacture of detergents. This is disclosed in General Aniline & Film Corp.'s United States Patent No. 1,932,180; in accordance with the previously announced policy of General Aniline & Film Corp., this patent is available for licensing upon reasonable terms. The products from this process are compatible with soap, and possess good lime soap dispersing power, important where hard water is encountered.

These products, known as taurides, are unique in their all-around compatibility with soap, and surpass many other synthetic detergents in this respect. They are also good detergents in themselves. They respond well to the action of alkaline builders, providing good bases for heavy-duty detergents. Such compositions give satisfactory results when used for many special purposes.

The intermediate *n*-methyltaurine offers industry an opportunity to tailor-make products with unusual and special properties, by combining it with various fatty acid chlorides in the C_{10} to C_{18} range, both saturated and unsaturated.

The bifunctional character of *n*-methyltaurine, which contains both a secondary amine group and a solubilizing sulfonic acid group, makes it of interest to dyestuff and pharmaceutical manufacturers, especially as a stabilizer and solubilizer. Because of its low molecular weight, it offers, pound for pound, more secondary amine combined with sulfonic acid than any other available compound.—*Industrial Chemicals Department, Antara Products, General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.*

TRICARBOXYLIC:

Organic Acid

(164B) Evans Chemetics, Inc., is turning out pilot-plant quantities of Evanacid 3 CS, a new organic acid. It is a tricarboxylic acid containing a thioether group.

Evanacid 3 CS reacts much like a typical tricarboxylic acid. It forms salts, amides, esters, acid chlorides and other derivatives in the same way that citric and aconitic acids do. Often the derivatives of the mono- or di-substituted products can be synthesized to yield a series of interesting products.

The new acid and its derivatives have many possibilities for use in such products as resins, plasticizers, surface-active agents and oil additives. Special alkyd resins modified by the thioether groups are made by reacting 3 CS with polyhydric alcohols. The trialkyl esters of Evanacid 3 CS are good plasticizers for polyvinyl chloride, vinyl copolymers and other elastomers.

Alkali and amine soaps of partial esters and amides of Evanacid 3 CS show outstanding properties as emulsifying and wetting agents, detergents and foaming agents.

Straight trialkyl esters, as well as lead, tin and other salts of 3 CS, its partial esters and its amides are all suggested for use in lubricating oils as antioxidants, extreme pressure additives and similar materials.

Other possible uses are as an intermediate for rubber chemicals and dyestuffs, as stabilizers for vinyl resins and chlorinated rubber. It likewise is suggested for use in the pharmaceutical and agricultural chemical industries.—*Evans Chemetics, Inc., 250 East 43rd St., New York 17, N. Y.*

NEW LINE:

Plasticizers

(164C) Morton-Withers Chemical Co. has announced its new line of Morflex plasticizers and the appointment of sales agents who will handle the distribution and servicing.

First of the new products is Morflex 100, which is an octyl phthalate produced by a new process and possessing some unusual properties. It is characterized by unusually good electrical properties and extreme resistance to heat aging, as denoted by retention of color, light transmission and elongation. Morflex 100 for the first time makes available an octyl phthalate that in one product will meet the Underwriters' aging tests on both 80 and 90 as well as 60 deg. C. wire. In fact, tests after seven days aging at 121 deg. C. indicate a drop in elongation of only 7 percent for a system consisting of 50 parts of Morflex 100 to 100 parts of vinyl chloride.

Of special interest to the film or sheeting manufacturer were tests indicating a retention of light transmission after seven days aging at 100 deg. C. of 94 percent as against only 25 percent for a standard competitive material of recognized high quality.

Following the Morflex 100, three additional products manufactured by the same process will shortly be available, these being an iso-octyl sebacate, an iso-octyl adipate, and a special product designed to give both low-temperature flex and high-temperature stability.

Sale of the Morflex line of plasticizers will be handled by Burgess Pigment Co., 64 Hamilton St., Paterson, N. J., in the New England, New York, upper New Jersey, Middle West, Chicago and far-western territories; and by Van Horn, Metz & Co., Inc., 508 Noble St., Philadelphia, Pa., in the Pennsylvania, lower New Jersey, Delaware, and Maryland territories. Southern sales will be handled by the producer.

Production facilities are being increased rapidly by Morton-Withers Chemical Co. for utilization of the new process and it is expected that output will reach a million pounds a month by the end of the year.—*Morton-Withers Chemical Co., P. O. Box 368, Greensboro, N. C.*

SELECTIVE:

Succinchlorimide

(165A) Arapahoe Chemicals, Inc., is now in semi-commercial production of n-chlorosuccinimide, also known as succinchlorimide. A pioneer in the manufacture of n-bromosuccinimide (NBS), Arapahoe manufactures its own succinimide, and the production of the chloro compound is thus a logical development. Arapahoe expects to extend to its new product its policy of buying back the crude succinimide produced as a byproduct of most reactions of NBS and NCS.

NCS, as the company has designated its new product, may have as useful applications as NBS has had, according to Dr. R. C. Waugh, president and technical director. It has been reported recently to be a specific and selective chlorinating and oxidizing agent. Benzyl chloride, for example, has been produced from toluene in yields of over 90 percent by chlorination with NCS, catalyzed by ultraviolet light or benzoyl chloride. Oxidation of benzyl alcohol to benzaldehyde was accomplished smoothly by NCS in approximately 75 percent yield. Further experimentation should lead to wider applicability of this reagent if the history of NBS is any guide.

In addition to its newly discovered uses, NCS has been recommended for the treatment of contaminated water, particularly in small quantities. By putting a small tablet of this powerful germicide in a canteen of water, all pathogenic organisms are reportedly killed in 5 to 20 min. Its stability, low toxicity and high tolerance for organic matter make it particularly attractive for this purpose. Data sheets and samples can be secured. Although Arapahoe is currently offering only a technical grade, it expects to announce an NF grade in a short time.—*Arapahoe Chemicals, Inc., 2800 Pearl St., Boulder, Colo.*

MEDIUM-CAPACITY:

Ion Exchange Resin

(165B) A commercially available medium-capacity cation exchange resin, designated as Amberlite IR-105G, is announced by the Resinous Products Division of Rohm & Haas Co. Because the new exchanger combines the hydraulic behavior of Amberlite IR-100 with the high capacity and regeneration efficiency of IR-105, it has replaced those products in the company's series of ion exchange resins.

The new IR-105G is a phenolic type resin furnished in granular rather than beaded form. This gives it improved hydraulic characteristics. Its physical ruggedness and chemical stability have been substantiated over a three-year period in small commercial-scale units. Its high regeneration efficiency adapts it particularly to hydrogen cycle operation, making it especially useful in deionization and split-stream dealkalization. In the sodium form, it is also suitable for water softening—*Rohm & Haas Co., Resinous Products Division, Washington Square, Philadelphia 5, Pa.*

GLACIAL:

Acrylic Acid

(165C) First commercial production of glacial acrylic acid, a derivative of beta-propiolactone, has been announced by B. F. Goodrich Chemical Co. This marks the entry of Goodrich into the acrylic field.

Manufacture of the new lactone derivative will begin shortly at the company's Avon Lake, Ohio, general chemicals plant. It will be available in ton lots from a semi-works unit.

The basic chemical, beta-propiolactone, was introduced by B. F. Goodrich Chemical Co. in 1947. Because of its extreme chemical activity, beta-propiolactone is the basic raw material for the manufacture of numerous synthetic organic chemicals (glacial acrylic acid is only one of the many products that can be prepared from it). It is essentially an internal ester of beta-hydroxy propionic acid. Its four-membered ring opens under the influence of a variety of reagents, such as salts of inorganic acids, alcohols, phenols, ammonia, amines, mercaptans and many other types of compounds, to form beta-substituted derivatives of propionic acid. However, the preparation of glacial acrylic acid involves only the molecular rearrangement of beta-propiolactone, parent material and product having the same molecular formula.

Although industrial acrylics are of fairly recent origin, acrylic acid was first manufactured 100 years ago, but has not been commercialized to any extent in this country. The product has only been sold in the water solution form. Now, for the first time, it will be available in the glacial or dry form, with over 97 percent purity, and containing less than 1 percent water.

Glacial acrylic acid has a molecular weight of 72.02, is a clear, colorless liquid boiling at 142 deg. C. at 760 mm. pressure. It melts at 12-13 deg. C., has a specific gravity of 1.048 at 20 deg. C., and a refractive index (N_D^{20}) of 1.420. Chemically it is extremely reactive and polymerizes rapidly in the presence of oxidative catalysts.

Advantages possessed by the glacial product are numerous. First, it can be esterified directly with any alcohol to make acrylic esters; this eliminates the time-consuming procedure of ester interchange. Second, monomeric acrylic acid dissolved in water is limited to emulsion or aqueous solution polymerization. In glacial form it can also may be used as a monomer or comonomer in polymerization conducted in organic solvents, or in bulk polymerization, commonly used in casting resins. Third, the availability of dry

(Continued)

More Information . . .

To find out more about any of these new products, circle the item's number on Reader Service Postcard inside the back cover.

This Month . . .

Extreme resistance to heat aging is claimed for an octyl phthalate plasticiner on p. 164. It is the first of a new line to be marketed soon . . . For news of acrylic acid in dry or glacial form see p. 165. Has less than 1 percent water . . . An organic peroxide with unusually high heat stability is described on p. 166, di-t-butyl peroxide, has a high decomposition temperature . . . On p. 169 you'll find a substitute to eliminate foaming and boiler water carry-over resulting from dissolved or suspended solids and high alkalinity or both.

Next Month . . .

Watch these pages for word about a new water soluble cellulosic that will find extensive use in many fields . . . Also news of an important bactericide designed for use in soaps and aimed at food handlers. There'll also be something about solutions of formaldehyde in various types of alcohol.

acrylic acid greatly facilitates the preparation of salts of acrylic acid, both metallic and ammonium. Fourth, many addition reactions with the double bond of acrylic acid are facilitated by the use of anhydrous conditions.

In addition it is more stable during shipment and storage than the water solution type, especially when properly stabilized. Also, shipping a pure material instead of a water solution offers marked economies.

The new glacial acrylic acid is expected to find wide usage in the plastics industry as a monomer, and in the chemical industry in general as an intermediate for the preparation of both esters and other derivatives.

High molecular weight acrylate monomers, such as butyl acrylate, 2 ethyl hexyl acrylate and others, can be readily produced from this product. These materials are water-clear liquids that can be polymerized and copolymerized with each other or other monomers, to form resinous materials ranging in properties from soft and rubber-like to hard and transparent plastics. Because of their high strength, good heat and light stability, water resistance and wide range of hardness and flexibility, the acrylate polymers find extensive usage in the manufacture of pressure-sensitive adhesives; surface coatings on fabric, wood, metal, paper and leather; in addition to serving as modifiers in the compounding of plastics and synthetic rubbers.

Glacial acrylic acid is also useful in the preparation of solid monomers such as sodium and calcium acrylates, and other metallic salts of acrylic acid. Calcium acrylate is now being tested by U. S. Army Engineers as a soil stabilizing agent for use in the building of emergency airfields and roads, hardening muddy or clay surfaces in a matter of hours.

The new acrylic acid will be sold initially in ton lots at $1.15 per lb. and in drum lot quantities at $1.25 per lb., with eventual prices becoming lower as production increases.—*B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.*

BIOCHEMICALS:

Pair of Amino Acids

(166A) Research quantities of L-threonine and DL-allothreonine are now available for the first time it has been announced by the Special Chemicals Division of Winthrop-Stearns Inc. Introduction of these two essential amino acids brings to 23 the total number of varieties offered by the company.

L-Threonine is the naturally occurring isomer and is the form normally required by both mammals and microorganisms for nutrition and growth. DL-Allothreonine is a stereo-chemical isomer of threonine.

Present availability of pure allothreonine may make it possible to determine whether this isomer produces a direct antagonistic effect when it is fed to mammals along with threonine itself.—*Special Chemicals Division, Winthrop-Stearns Inc., 1450 Broadway, New York 18, N. Y.*

SUSPENDING AGENT:

Starch Derivative

(166B) Nu-Film, a starch product that acts as a soil suspending agent and does it at a fraction of the cost of other cellulose derivatives, has just been introduced by National Starch Products Inc.

The new starch, an acid ester derivative containing sodium carboxylate and sulfonate groups, has demonstrated marked ability as a soil suspending agent when used with detergents. Whiteness retention tests on unsized cloth have shown the exceptional performance of Nu-Film in preventing redeposition of dirt onto textile fibers, particularly when Nu-Film is compounded with detergents of the alkyl aryl variety.

Nu-Film also has properties of interest for the formulation of laundry starches and household liquid starches. In addition, it is suitable for warp sizing and finishing cotton and rayon fabrics. Laboratory tests indicate that the Nu-Film size can be removed from fabrics without the use of enzymes.—*National Starch Products Inc., 270 Madison Ave., New York 16, N. Y.*

STABLE:

Organic Peroxide

(166C) The Lucidol Division of Novadel-Agene Corp. is now shipping commercial quantities of di-*t*-butyl peroxide from stock. An unusually stable organic peroxide, di-*t*-butyl peroxide has a high decomposition temperature.

This peroxide is a good source of free radicals. As such, it finds use as a raw material in organic syntheses and as a polymerization catalyst, particularly at temperatures above 100 deg. C. The commercial product assays 97.0 percent minimum. This is equivalent to a minimum active oxygen content of 10.6 percent.

Shipment is made as a flammable

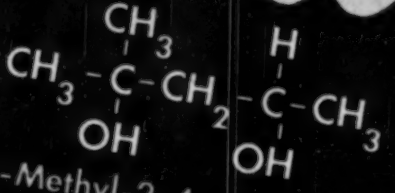
(*Continued*)

MILDEW CONTROL BY CUNILATES

(166D) The canvas bucket at the left has been protected against mold decay by one of the Cunilates developed for the Air Force by Scientific Oil Compounding Co., Inc., of Chicago. Comparing it with a similar bucket that almost completely disintegrated after a 28-day soil burial test, is Victor N. Kalberg, who developed solubilizing technique. Active ingredient in the Cunilates, available in permanent and non-toxic solutions and emulsions, is Milmer 1, Monsanto Chemical Co.'s copper 8-quinolinolate. The Cunilates have been approved for many other government and service specifications of leather, canvas, cordage and plastics products.—Monsanto Chemical Co., 1700 S. Second St., St. Louis, Mo.

FROM SHELL CHEMICAL

HEXYLENE GLYCOL



(2-Methyl-2, 4-pentanediol)

A versatile, stable glycol with a variety of industrial applications

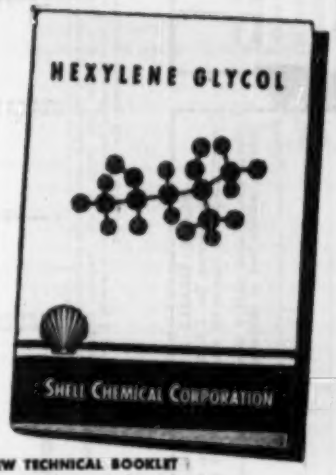
THE DIVERSIFIED USES of Hexylene Glycol are a result of *four* distinguishing features. Hexylene Glycol is (1) an ideal coupling or blending agent; (2) a high-boiling (198.3° C) solvent and penetrant; (3) an efficient wetting and dispersing agent; and (4) a mild humectant.

Hydraulic Brake Fluids. Brake fluids which contain Hexylene Glycol have high tolerance for moisture . . . show little tendency to promote rubber swelling . . . exhibit low corrosion characteristics . . . form clear solutions with other castor oil brake fluids.

Printing Inks. At ordinary temperatures press stability is insured by the low vapor pressure and mild hygroscopicity of Hexylene Glycol. At elevated temperatures of flash-dry ovens the relatively high volatility of Hexylene Glycol permits fast drying with higher, more uniform press speeds.

Cleaning Compounds. Hexylene Glycol, as a coupling agent in engine cleaners and general industrial cleaners, effects stable and homogeneous emulsions. In pre-spotting soaps, Hexylene Glycol couples the soap with water, contributes solvent power and facilitates the removal of last traces of soap and water during dry cleaning.

Other applications suggested by the coupling, wetting and high solvency properties of Hexylene Glycol include soluble cutting oils, grinding fluids, wood fungicides and textile assistants.



NEW TECHNICAL BOOKLET
Contains data on industrial applications . . . includes useful charts, tables, properties and specifications.

Booklet mailed on receipt of your letterhead request. Samples of Hexylene Glycol are available for your evaluation.

SHELL CHEMICAL CORPORATION

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Isolates Inflammable Materials Instantly - Operates Automatically To Eliminate Costly Tank Fires

Flame Arrestor Bank

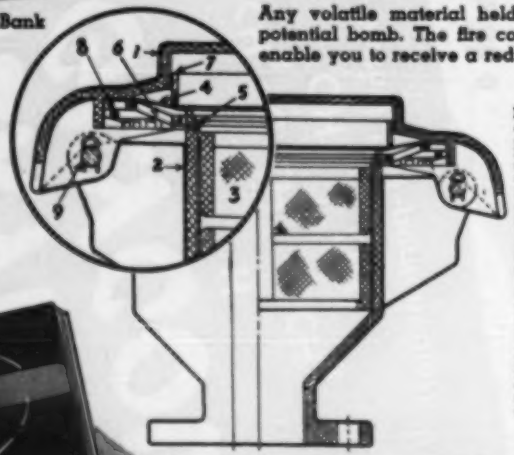
Flames cannot penetrate the honey-combed construction of the all aluminum BS&B FLAME ARRESTOR bank. It is a neat, compact unit which becomes an integral part of the BS&B VVFA Vent Valves. The Arrestor bank prevents propagation of flame into tank. The Valve is designed to function under internal pressure or vacuum.

Operation is fully automatic. No hand snuffing or manual attention is required. It is quickly removed ... for cleaning or replacement.

Any volatile material held in tank storage without proper protection is a potential bomb. The fire control advantages of the FLAME ARRESTOR may enable you to receive a reduced insurance rate. It will pay you to investigate.

Here is the complete package. ARRESTOR bank is shown seated in the VVFA VENT VALVE. The suspended steel ring holds bank firmly in place. Easily installed. Years of dependable service.

SPECIFICATIONS: 1. Cover—cast aluminum. 2. Body—cast iron. 3. Flame Arrestor Bank—rolled aluminum. 4. Flap—synthetic rubber. 5. Retaining spring—steel. 6. Retaining ring—aluminum. 7. Vacuum ring—steel. 8. Retaining ring spring—steel. 9. Hinge pin—stainless steel. NOTE: Bolt circle corresponds to 150 ASA unless special drilling specified.



Pressure-Vacuum Vent Valve Flame Arrestor 2, 3, 4, and 6 inch sizes; internal opening pressure (ounces) minimum 0.5, maximum 1.75, and vacuum opening (ounces), 0.5. **Pressure-Vacuum VVFH Vent Valve** (Does not include Arrestor bank) Used as secondary relief valve or, as primary relief valve where Arrestor bank is not required.

Valve Inch Size	Opening Pressure Ounces		Vacuum Opening Ounces
	Minimum	Maximum	
2	3.5	16	0.5
3	3.5	16	0.5
4	2.5	16	0.5
6	2.5	16	0.5
8	2.5	16	0.5
10	2.5	16	0.5
12	2.5	10	0.5
16	2.5	8	0.5
20	2.5	8	0.5
24	1.5	4	0.5

NOTE: Pressures in this table are for cast aluminum cover, and they will differ from other metals. Pressure ratings require a manufacturing tolerance of plus or minus 5 per cent. Vacuum opening can be increased.

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FLAME
ARRESTOR

liquid (Red Label) in amber glass bottles, 1 and 6 lb. net, and in ICC-17E steel drums, 30 lb. (5 gal.) and 98 lb. (15 gal.) net. Technical data, price quotations and samples are available.—*Lucidol Division, Novadel-Agene Corp., 1740 Military Road, Buffalo 5, N. Y.*

REACTIVE:

Diallyl Amine

(169A) Pilot-plant quantities of diallyl amine $(CH_2 = CH\text{-}CH_2)_2NH$, are currently being produced by Edwal Laboratories, Inc. Its chemical properties are typical of a secondary amine, the double bonds making it highly reactive.

Diallyl amine has the following characteristics: molecular weight, 97; specific gravity, 0.7854 at 25 deg. C.; refractive index, 1.43 percent at 25 deg. C.; boiling range, 106-108 deg. C.; solubility in water, 8 percent at 25 deg. C. It is miscible with ethanol, ether, benzene and mineral oil. Its odor is fishy and ammonical; its color, white.

Suggested uses are as an intermediate in the manufacture of pharmaceuticals and resins, and for organic synthesis.—*Edwal Laboratories, Inc., Ringwood, Ill.*

ELIMINATES FOAMING:

Boiler Water Treatment

(169B) A new product, Concentrol, a special treatment to eliminate foaming and boiler water carryover due to high alkalinity, dissolved solids, suspended solids or any combination of them, has recently been developed by Bird-Archer Co.

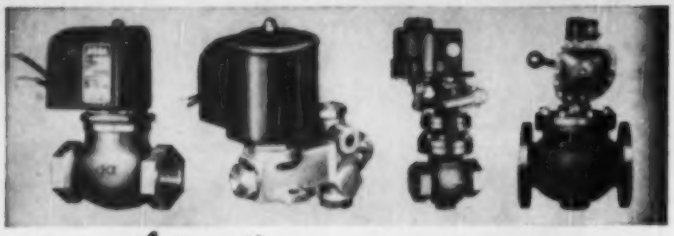
Essentially a surface-active agent of the polyalkylene glycol group, Concentrol functions by effecting a rapid change in surface tension of steam bubbles that permits coalescence of small steam bubbles into bubbles of larger size. This results in the formation of unstable bubble films that break readily upon reaching the steam disengaging surface of the boiler water. Thus building up of foam and subsequent boiler water carryover are eliminated.

Concentrol is supplied in several different formulations, some of which contain selected tannins, which condition boiler water sludge and suspended matter, maintaining them in a highly fluid, non-adherent form. Concentrol may be safely fed through feedlines; in fact, when fed continuously, it will help inhibit feedline deposits.

Actual amount of Concentrol re-

(*Continued*)

B&B
B&B COMBINATION VENT VALVE
flame arrestors
Give Fire Protection - Save You Money
Listed by Underwriters' Laboratories



Ideal *Automatic* Control for Liquid or Gas Flow!

You can't beat the solenoid operated valve for many conditions where the flow of a liquid or gas must be automatically controlled. And the meaning of "controlled" covers quite a range of services. For example, in the line of ASCO Solenoid Valves you can get automatic control through the following, each functioning differently.

- *Safety Shut-off and Trip Valves*
- *Shut-off Valves—Packed Type*
- *Shut-off Valves—Packless Type*
- *3-Way Pilot Valves*
- *2-Way & 3-Way Pilot Controlled Valves*
- *4-Way Pilot Valves*

Everyone of these valves functions automatically either in an emergency or in timed cycles, depending upon the design and application. Some reset manually; others, electrically. They are designed for use on pipe lines conveying liquids or gases or on processing machinery which must be protected by an automatic flow control or which requires automatic timing of the flow in its operation. We suggest that if some type of automatic control of liquid or gas flow is required in your plant, you investigate ASCO Solenoid Valves. They are constructed to meet many corrosive conditions and many have explosion-proof and water-proof solenoids. Many, too, are of the design approved by Factory Mutuals and Underwriters' Laboratories.

In writing for literature, tell us in detail about your requirements.

When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

ASCO Solenoid Valves

Automatic Switch Co.

301 LAKESIDE AVENUE • ORANGE, NEW JERSEY

Versatile Top Entering Mixer by *Eastern*

Versatile! Series C Vertical Mixers do big mixing jobs quickly and thoroughly. Their power range is from ¼ to 15 H.P. at standard speeds of 1725, 1140, 420, and 280 R.P.M. Standard NEMA ball-bearing type motor is furnished. Stuffing box is separate component and can be specified in any alloy for low original cost. Write our engineers about your mixing problem. Their service is without obligation.

Send now for new **Eastern** Mixer Catalog No. 600

Write for new Eastern Mixer Catalog No. 600

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***Eastern* INDUSTRIES, Inc.**

296 ELM STREET • NEW HAVEN 6, CONNECTICUT

quired to eliminate foam depends upon the nature of the feedwater and boiler concentrations. Foaming has been eliminated in plants that have to carry as high as 12,000 ppm. of dissolved solids and 7,000 ppm., of alkalinity. In laboratory tests and development work, foaming was actually stopped at the concentration of 30,000 ppm. of dissolved solids.—*Bird-Archer Co., 400 Madison Ave., New York 17, N. Y.*

FLOWS FREELY:

Anti-Caking Agent

(170A) Furfil is a free-flowing powder used as an anti-caking agent and as a conditioner for mixed fertilizers. It is comprised principally of modified cellulose, lignin, and a small amount of ash. A typical analysis of Furafil would show the following results (moisture free basis):

	Percentage
Cellulose	38
Residue from saccharification (lignin and resins)	42
Ash	4–5
Solubility	
Water (hot)	16
Acetone	20
Ether	4

Furafil is produced at two plants by the Quaker Oats Co. Its manufacture is carried on throughout the year. It is shipped in car lots, bulk or bags.

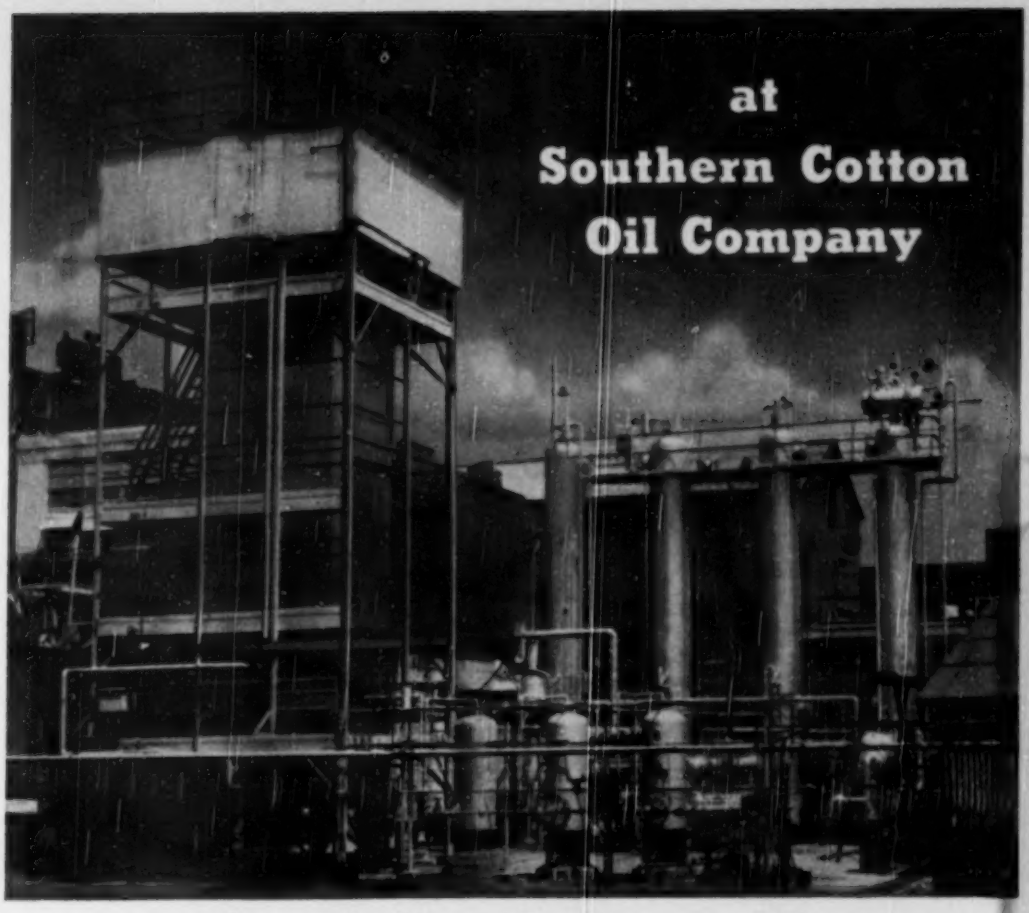
In addition to its fertilizer use, Furafil finds application as a burn-out material and bulking agent in mixed foundry sands, where its controlled ignition characteristics are important.

Highly absorbent, Furafil is capable of holding its own weight of water, but it is not hygroscopic. Its high carbon content makes it a potential source of activated carbon.

Furafil's properties are best determined by laboratory tests. Samples and further information on this new, interesting material can be secured from the producer.—*Quaker Oats Co., Chemicals Department, Merchandise Mart Plaza, Chicago 54, Ill.*

Ethylene Trithiocarbonate

(170B) Stauffer Chemical Co. announces the availability of ethylene trithiocarbonate, a bright yellow to brown crystalline solid. Among other uses, it has promise as an intermediate in the manufacture of organic chemicals, in the vulcanization of rubber, as a flotation agent, a sulphur solvent and as an ingredient of extreme pressure lubricants.—*Stauffer Chemical Co., 420 Lexington Ave., New York 17, N. Y.* —End



another **Girdler Hydrogen Plant** lowers processing costs

Works speak louder than words

GAS PROCESSES DIVISION

THE *GIRDLER* CORPORATION

LOUISVILLE 1, KENTUCKY

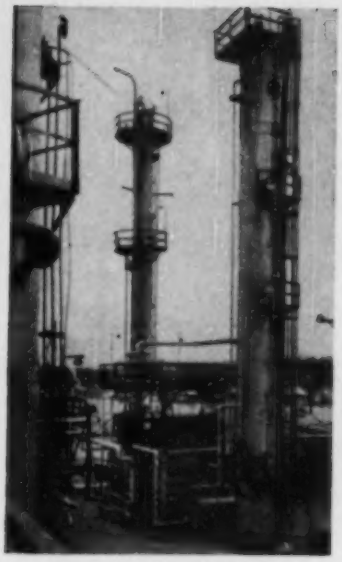
Designers, Engineers and Constructors

FOR THE PROCESSING of fats and oils a reliable supply of pure hydrogen was needed by Southern Cotton Oil Company (subsidiary of Wesson Oil & Snowdrift). So, on the basis of first-hand experience, Southern Cotton Oil ordered its second Girdler HYGIRTOL* plant—the *best way* for producing *high-purity hydrogen* at the *lowest cost.* A third plant in Chicago has been contracted and a plant in Houston for the South Texas Cotton Oil Co. (another subsidiary of Wesson Oil & Snowdrift) makes four Girdler hydrogen plants for this aggressive Company.

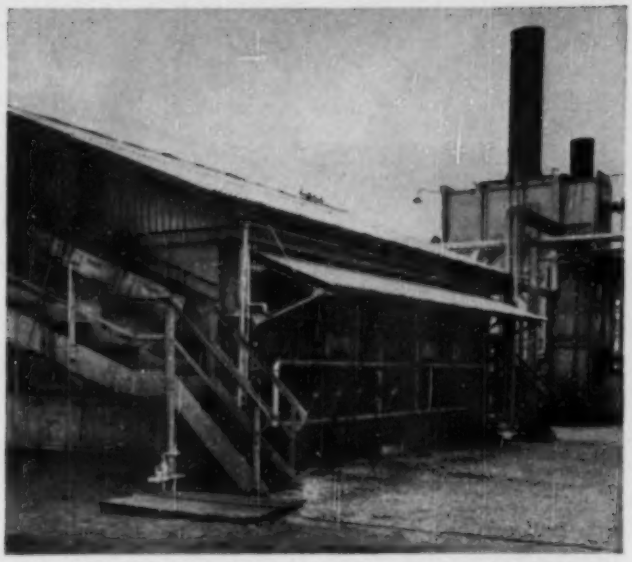
Southern Cotton Oil has found its HYGIRTOL plants not only economical, but simple to operate. Only one man per shift is required—operation is continuous. For fuel and process material you can use natural gas, propane and butane—gases which are reasonable in cost, readily available, easy to handle.

If gas processing is a factor in your costs, let us help you economize. We design and build plants to produce, purify or use chemical process gases. Write now for complete information.

*HYGIRTOL is a trade mark of The Girdler Corporation.



1 Prefractionator is in the foreground. Back column is the stabilizer.



2 Dehydrogenation of naphthenic hydrocarbons requires a high heat input. This is the pre-heater at the Old Dutch Refining Co. Platforming plant.

"Platforming"

PLATINUM CATALYST REFORMING

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Here is a process developed by Universal Oil Products Co. for improving the octane rating of straight run and natural gasolines. The term "Platforming" represents the reforming of gasolines in the presence of hydrogen using a platinum catalyst.

Use of platinum as a catalyst virtually eliminates wasteful side reactions. It also permits continuous operation because there is no need for catalyst regeneration.

There are three major reactions which occur in Platforming a straight run gasoline. The first is dehydrogenation of naphthenic hydrocarbons to the corresponding aeromatic hydrocarbons. These endothermic dehydrogenation reactions contribute to the octane gain and heat of combustion of the gasoline.

Second important reaction is the opposite of dehydrogenation from the standpoint of yield and heat of reaction. This is the reaction of hydrocracking wherein a high molecular weight hydrocarbon, decane, is decomposed into specific lower molecular weight compounds, isopentane and normal pentane. In actual operation some butane and hexane as well as propane and heptane are also formed.

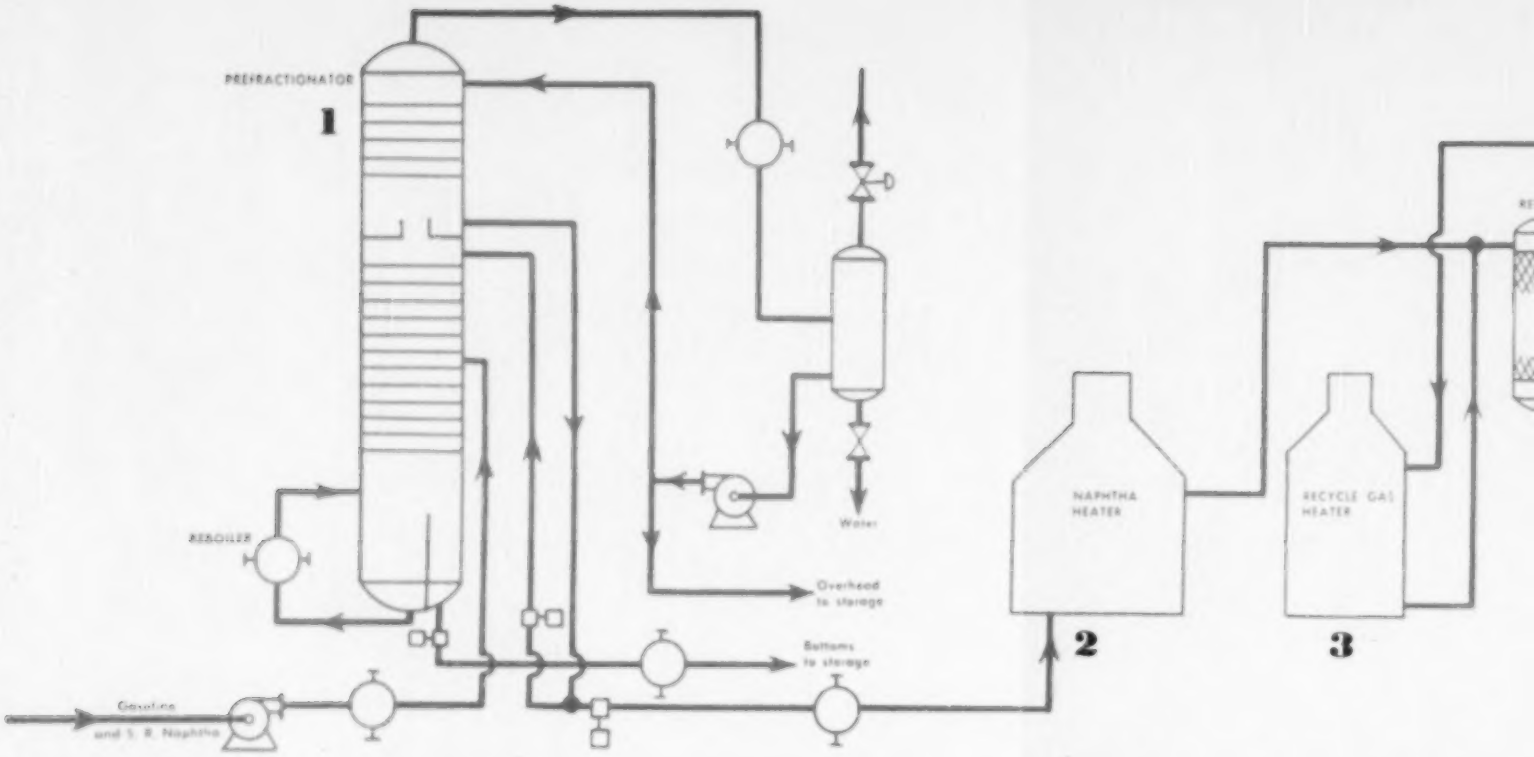
If two pentane molecules were always formed, the volumetric yield of such a reaction (at 100 percent conversion) is 118 percent along with an octane number gain of more than 100 units. There is, however, a small loss to propane and lower hydrocarbons with the result that only a part of that high gain in volume and octane number can be realized. The reaction is exothermic and, therefore, provides some of the heat of reaction required for the dehydrogenation step.

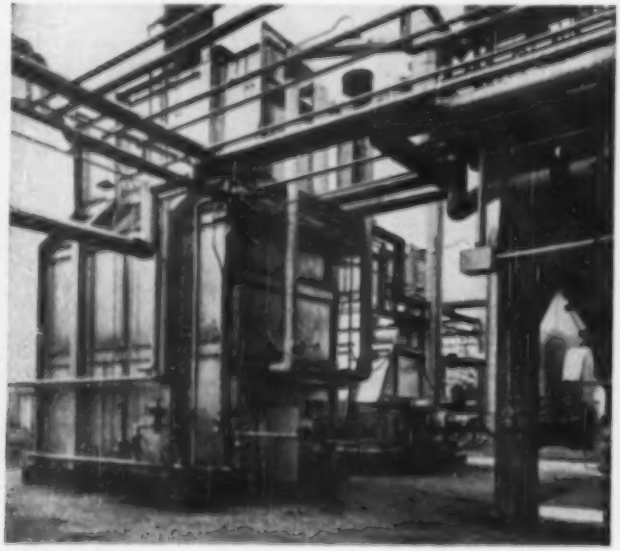
The third major reaction in Platforming is isomerization. Five-membered ring naphthenes undergo isomerization to six-membered ring naphthenes prior to their conversion into aromatics. Likewise, the isomerization of paraffins proceeds readily at Platforming conditions.

In addition to the three major reactions that occur in Platforming, there are other important reactions. These include dehydrocyclization, wherein paraffins are converted directly to aromatics, and desulphurization, wherein virtually all of the combined sulphur is converted to hydrogen sulphide.

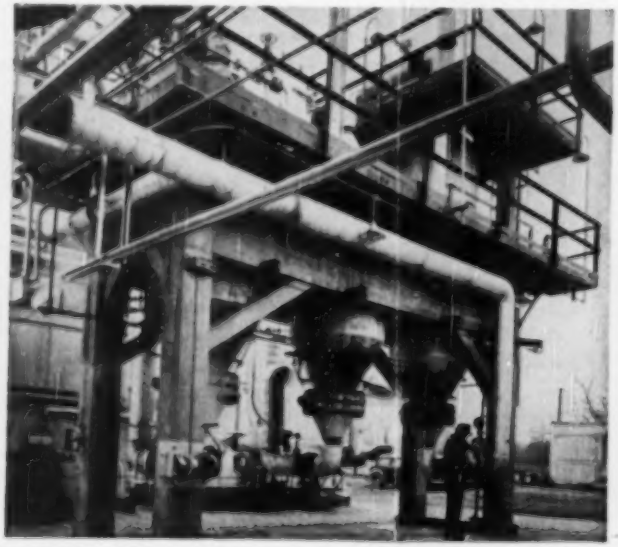
Platforming is unique among reforming processes from a standpoint of low methane production. With the Platforming catalyst, a high pressure operation gives only a small amount of methane and as the temperature is increased the selective hydrocracking reaction is quenched by the dehydrogenation reaction. Thus there is no tendency to develop run-away temperatures in the operation. In addition, the formation of high molecular weight compounds is essentially eliminated in Platforming. Therefore Platformates do not require rerunning.

The plant is simple, involving merely a preheating and reactor section, a recycle gas compressor, and conventional fractionation for feed preparation and product recovery.

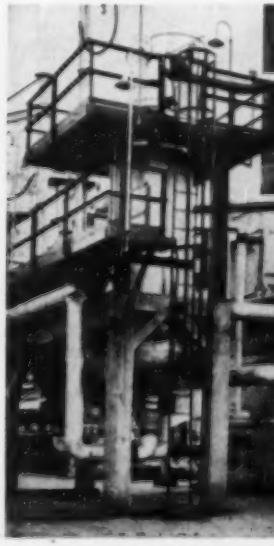




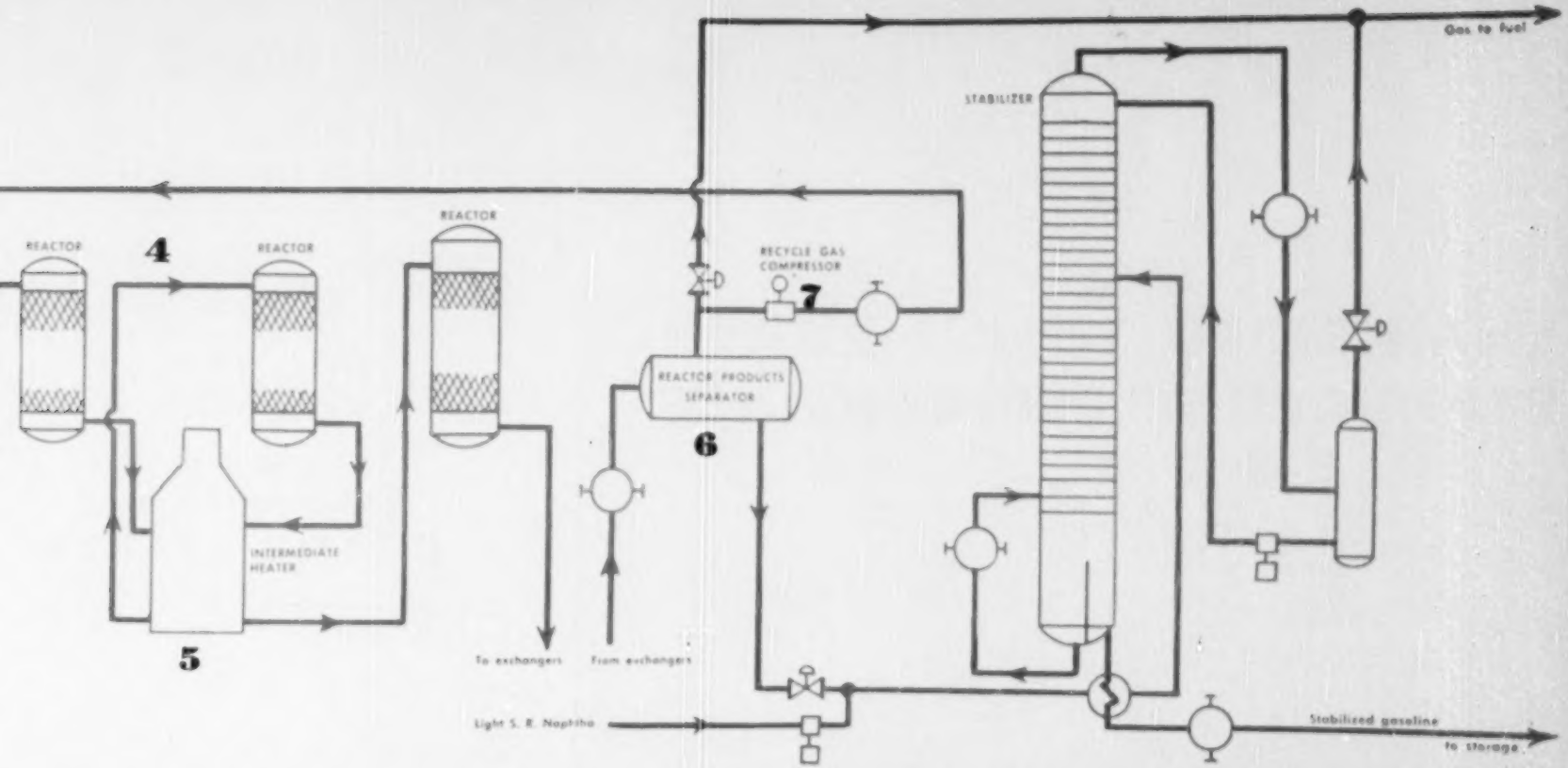
3 Recycled aromatics are heated here before re-entering the first reactor. Temperature of the charging stock is 180-360 deg. F.

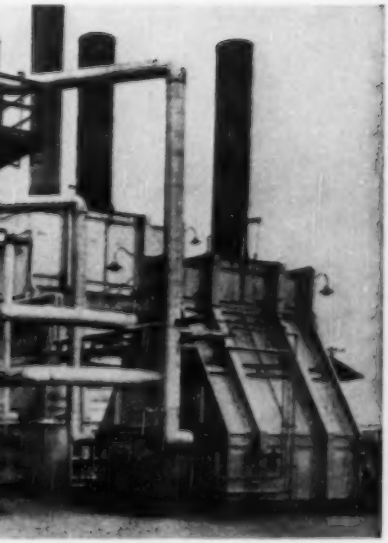


4 Methylcyclohexane and its isomer, dimethylcyclopentane, are converted to toluene and hydrogen. There are three reactors.

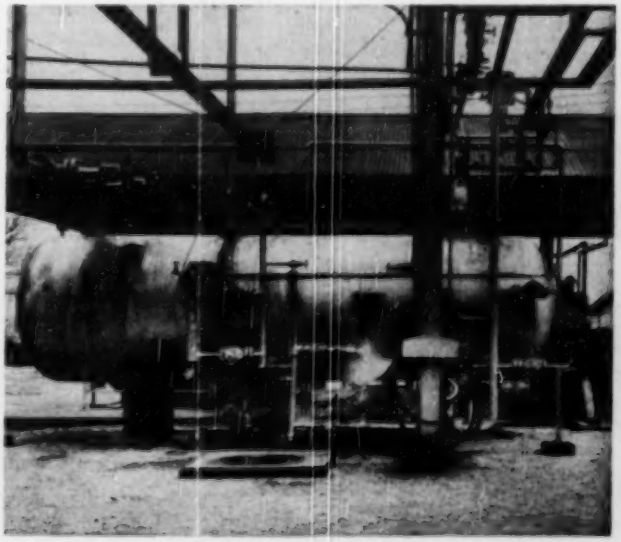


5 Four variables in Platforming hydrogen recycle rate. Interme

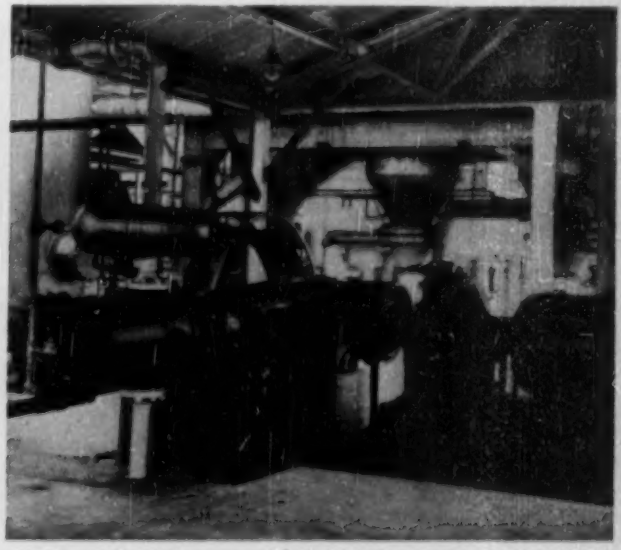




ning are temperature, space velocity, pressure and termediate heater is in right foreground.



6 Hydrogen makes up 80 to 85 percent of the gas leaving this separator. Liquid is reformed gasoline with a leaded-octane level of 93 or higher.



7 Gas to be recycled is compressed here before it goes to the heater. Operating pressure governs the ratio of volatility to aromatic content.

It was 1912—and the Girl Scouts of America were founded by Mrs. Juliette Low—when we introduced "Flexitallic", the *original* Spiral-Wound Gasket, and opened to Industry new fields of opportunity in the confining of fluids at high pressures and temperatures.

ENGINEERED TO AN EXACT STANDARD OF PERFORMANCE

Flexitallic Spiral-Wound Gaskets range in size from one-half inch to 104 inches . . . In price from a few pennies to hundreds of dollars . . . In application to pressures of 10 thousand pounds . . . For temperatures to 1800°F.

Each Flexitallic Gasket is engineered from the ground up for operation at specified temperatures and specified pressures—and to meet particular conditions of thermal and physical shock, corrosion, vibration and unusual joint stress.

The basic Flexitallic principle—the spiral winding of V-shaped spring-like metal plies alternating with plies of filler—lends itself naturally to almost unlimited variation.

The physical and chemical properties of the several metals, the different types of filler, the relation of filler to metal in the winding—all these are *variables* in the hands of the Flexitallic engineer.

Using the most precise instruments for determination of yield values, resilience and gasket density, the Flexitallic engineer builds each Flexitallic Gasket to an *exact standard of performance.*

Many Flexitallic Gaskets — originally designed as "specials" for oil refineries, chemical industries, power plants, shipyards, ship-operating companies — are now "standard" gaskets in the Flexitallic line.

If safe sealing is of serious concern to you, give us these facts on your gasketing requirements: (1) Fluid to be confined; (2) Type of Flange and dimensions; (3) Operating pressures and temperatures; (4) Bolting data.

In return we will send you a genuine Flexitallic Gasket. Test it severely—in your laboratory or on the job. Results will show you why most industries in the high-pressure, high-temperature fields are standardized on Flexitallic Spiral-Wound Gaskets.

FLEXITALLIC GASKET COMPANY
Eighth and Bailey Streets, Camden 2, N. J., U.S.A.

The name "Flexitallic" is the registered trade mark identifying the *original* (patented) Spiral-Wound Gasket. Now—for your protection and ours—this trade mark FLEXITALLIC is stamped into the outer ply of every *genuine* Flexitallic Gasket. Your guarantee of quality.

want unusual performance like this?

Switch to performance-proved
CRANE VALVES

CASE HISTORY FROM CRANE FILES

PROBLEM: To eliminate the all-too-frequent and costly replacement of valves on phosphoric acid lines in a pharmaceutical process.

WORKING CONDITIONS: Valve required to precisely throttle 50% phosphoric acid flow at the rate of ½ gal. per minute. Valve operated steadily for 8 hours each day, then closed with acid in line for remaining 16 hours.

SOLUTION: Crane No. 18850 18-8 Mo Stainless Steel Plug Gate Valve.

RESULT: After more than 30 months' service, Crane Plug Gate showed no wear or indication of damage from etching, and continues to perform at full efficiency. Only maintenance is periodic repacking essential to such acid service. User reports that several other valves were tried, but none approached the performance of the Crane No. 18850 Plug Gate for long life and accurate flow regulation.

A typical example of the long life and low-cost maintenance that make Crane Quality the best value in all types of valves. That's why... **More CRANE VALVES are used than any other make.**

(Right) Photo of subject installation

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VALVES • FITTINGS • PIPE

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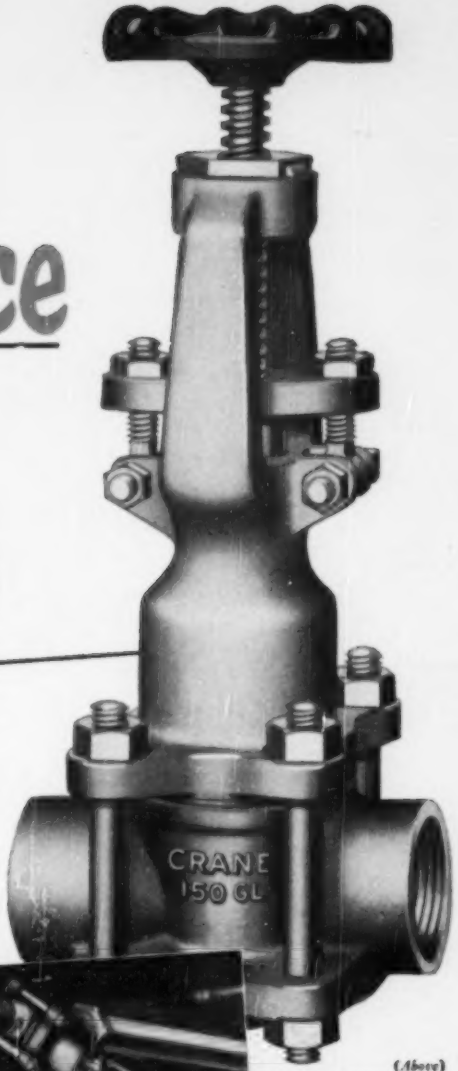
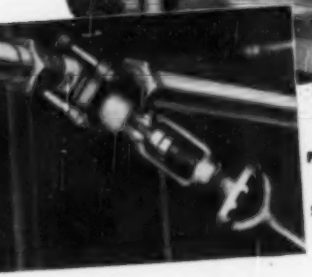
...Plug





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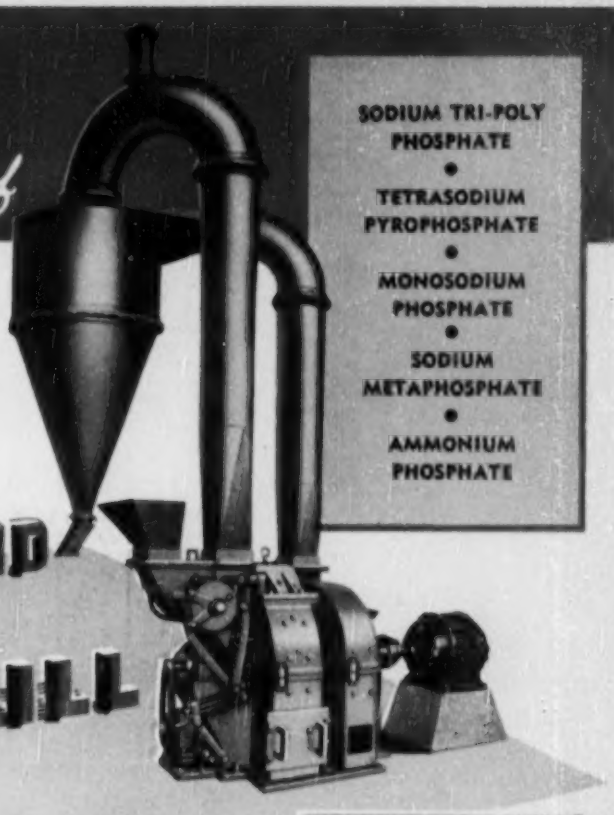

Most of the above Phosphate Materials, produced in modern chemical plants today, are pulverized with Raymond Imp Mills.

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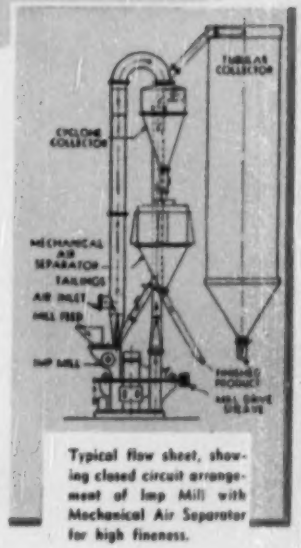
For further details of the operation and applications of the Imp Mill write for new Raymond Catalog #67.



Typical flow sheet, showing closed circuit arrangement of Imp Mill with Mechanical Air Separator for high fineness.

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Chemical Engineering News

JOSEPH A. O'CONNOR, News Editor

AIChE to Get Inside Story of Management at Symposium

The inside story of how chemical enterprises are managed will be told to chemical engineers this month at a symposium to be sponsored by the New York Section of the American Institute of Chemical Engineers. Top executives of the process industries will present their story of how chemical management works. The symposium will be held on Tuesday, October 24, at the Hotel Statler in New York.

Functions of management will be explained by President John McKeen of Chas. Pfizer & Co., Inc. Robert L. Gibson, assistant general manager of General Electric Co.'s Chemical Department, will blueprint the organization of management. George B. Corless, executive development advisor for the Standard Oil Co. of New Jersey, will discuss executive development. President William P. Witherow of Blaw-Knox Co. will discuss industrial relations.

Dinner speaker will be Dr. Robert E. Wilson, board chairman of Standard Oil Co. of Indiana, who will map a "Strategy for True Liberals." Toastmaster will be Dr. Donald B. Keyes, vice president of Heyden Chemical Corp.

Symposium sessions will start at 2:00 p.m.; they will be held in the Penn Top of the Statler. Dinner will be at 7:00 p.m. in the Statler's Grand Ballroom.

For those who register, dinner will cost $6; for those not registering, dinner will be $7. Registration fee for members of New York and New Jersey local sections will be $2; for non-members registration will be $3; for students, $1. Chairman of the symposium is Edgar L. Demarest, Buflovak Equipment Division of Blaw-Knox Co., 295 Madison Ave., New York.

Ten Companies Join Forces To Run Wartime GR-S Plant

The $7 million government-owned synthetic rubber plant in Louisville, Ky., operated from 1942 to 1947, is being reactivated and is expected to be back in full operation by Jan. 1, 1951. Reactivation of the plant will provide some 350 jobs and bring a $1 million a year payroll to Louisville.

The plant has been ordered out of mothballs by the government and will be operated by a newly organized corporation known as Kentucky Synthetic Rubber Co., owned by 10 rubber companies outside the tire industry.

Thomas Robins, Jr., president of Hewitt-Robins Inc., is president of Kentucky Synthetic, which will operate the plant under contract with the RFC. All raw materials and the crude rubber which will be produced, will be owned by the government. The rubber will be of the butadiene-styrene type. The plant was operated previously by the National Synthetic Rubber Corp.

The Louisville plant is another of the synthetic plants ordered back in operation since the beginning of the Korean crisis. However, it may be among the first to get into operation.

Robins says, "Our schedule calls for beginning operations January 1, but everything possible is being done to get going before that time."

The plant has been maintained in mothball condition by a crew under contract with the Minnesota Mining & Manufacturing Co.

In Louisville recently to begin taking inventory prior to beginning of reconditioning operations were several officers of the new corporation. Among them were George F. Goodyear, secretary and general counsel of Kentucky Synthetic and Leo Clifford, controller and assistant secretary. Both men are from Buffalo, where they are associated with the Hewitt-Robins organization. Also in Louisville is Robert Eck, Trenton, N. J., treasurer of the new company. Eck is treasurer of the Goodall Rubber Co., one of the 10 rubber companies participating in the operation of the plant.

Besides Hewitt-Robins, the firms participating are as follows: American Hard Rubber Co., New York N. Y.; Boston Woven Hose & Rubber Co., Cambridge, Mass.; Brown Rubber Co., Inc., Lafayette, Ind.; Dryden Rubber Division, Sheller Manufacturing Co., Portland, Ind.; Goodall Rubber Co., Trenton, N. J.; Raybestos-Manhattan, Inc., Passaic, N. J.; Sim-

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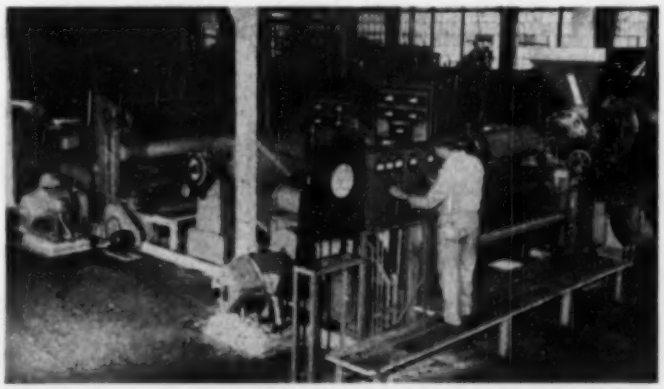

ST. REGIS EXPANDS POLYETHYLENE-COATING FACILITIES

Newest polyethylene-coating equipment has just been placed in commercial production at the Carthage, N. Y., paper mill of St. Regis Paper Co. This 10-ton coater can operate in a range from 50 to 600 ft. per min., permitting a capacity of upwards of 3,000 lb. per hr. of polyethylene-coated paper in any thickness from 0.5 to 7 mils, and in any width up to 90 in. Kraft paper moves through a series of rolls at the front of the machine to receive the plastic coating, and then is carried to the rear of the machine for rewinding and slitting. Electrical controls insure high-quality coatings. St. Regis has tripled facilities for coating kraft paper with polyethylene to meet the demand for specialty papers and multiwall shipping sacks containing this thermoplastic protective barrier ply.

plex Wire & Cable Co., Cambridge, Mass.; Sponge Rubber Products Co., Shelton, Conn.; and Thiokol Corp., Trenton, N. J.

It is believed to be the first time the government has gone outside the tire industry to pick management from the rubber industry for a synthetic plant. However, the bigger rubber companies have loaned technical assistance and Firestone Tire & Rubber Co. has been engaged by the new company to conduct actual demothballing of the plant, which will include installation of new machinery necessary to meet new production techniques developed since the end of World War II.

Speed with which the operators are moving to get the plant into production is indicated by the fact that the government's letter of intent from the RFC was received by Robins, president of the new company, on August 28. Five working days later the corporation had been set up, and executives established in Louisville to start the demothballing process. The plant has a rated production capacity of 30,000 tons of rubber per year.

Goodrich Expands Capacity For Vinyl Resin Production

A substantial expansion of B. F. Goodrich Chemical Co.'s general chemicals plant at Avon Lake, Ohio, will commence immediately, it is announced by W. S. Richardson, president.

The new manufacturing facilities will produce Geon polyvinyl chloride resins, increasing the company's productive capacity in an effort to meet future military requirements and the growing demands of industry for this versatile plastic, the chemical company executive states.

"The polyvinyl chloride industry, which played such a vital role in World War II in supplying vast quantities of resin for urgent military usage, has been a healthy and expanding one through its policy of continual investment in research and development," Richardson says. "A great demand has been created for the vinyls, which are readily converted into myriad consumer and industrial goods, and their essentiality becomes even greater in time of war," he adds.

In World War II vinyl resins were high-priority materials used as flameproof insulation on Navy shipboard wire and cable circuits and Army signal equipment, grommets and gaskets for aircraft and motor vehicles, coatings on such products as oxygen tents, hospital sheeting, raincoats and protective clothing.

"The vinyls are certain to assume a vastly greater role than before because of a tremendous growth and diversification of the industry within the past five years, making a host of new products available in volume at low cost," Richardson states.

The new plant, to be completed in mid-1951, will cover seven acres on the company's 225-acre tract at Avon Lake, 22 mi. west of Cleveland, where there is located at present a general chemicals plant, experimental station, and currently under construction, an applied research laboratory. The vinyl resin plant will consist of two buildings—a three-story process building with 40,000 sq. ft., and a warehouse.

Engineering and process construction will be handled by the Girdler Co., Louisville, Ky., while plant buildings, underground sewers, roads and other facilities will be built by the Sam W. Emerson Co., Cleveland.

B. F. Goodrich Chemical Co. also operates plants in Louisville, Ky., Niagara Falls, N. Y., Akron, Ohio, and the huge government-owned synthetic rubber plant at Port Neches, Tex.

MONSANTO'S KING SIZE PHOSPHORUS FURNACE

Work on the biggest phosphorus furnace in the world and one of the largest electric furnaces ever built is under way at the Monsanto, Tenn., plant of Monsanto Chemical Co. Construction of this sixth electric furnace for the production of elemental phosphorus is expected to be completed during January 1951. The new furnace will have a rating of 25,000 kw.

California Producer Boosts Capacity for Crude Salt

Construction of a crude salt plant at Redwood City, Calif., by Leslie Salt Co. is now under way. Nine evaporation ponds will have a total area of about 500 acres. In addition, a salt stacking area covering 360,000 sq. ft. and a 450-ft. wharf, together with auxiliary equipment for handling salt, will be included in the project. Leslie is one of the major producers of salt in the West.

Redwood City is about 25 mi. down the peninsula from San Francisco. The wharf is on Redwood Creek, which empties into the lower end of San Francisco Bay. Leslie's older evaporation and refining facilities are located eastward across the bay near Newark.

When Leslie completes its expansion program early next year, its total capacity should be over 800,000 tons a year. The company's 1949 crop was 734,700 tons, up 88,900 tons over the 1948 harvest.

Dock facilities at Redwood City for loading bulk salt directly from storage to ships will be ready next January. The initial salt harvest should be ready late in 1951, and an even bigger harvest is anticipated in 1952.

Big West Coast GR-S Plant Going Back Into Operation

Minnesota Mining & Manufacturing Co., as agent for the Office of Rubber Reserve, and Pacific Rubber Co., as associate, have been awarded the contract to reactivate and operate a $22 million government-owned synthetic rubber plant at Torrence, Calif., just south of Los Angeles.

The plant, which was operated during World War II by Goodyear Tire

(Continued)

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Processing, too, must be continuous if it is to be truly economical and fast. De Laval machines make most effective use of centrifugal force to speed up production by getting rid of unnecessary interruptions. Where once hours were required for settling or other inefficient methods of separation or clarification, now the same work can be performed in a few minutes or even seconds by De Laval centrifugals.

There are many different types and sizes of De Laval machines, each designed for a specific service under one of the three basic classes of service:

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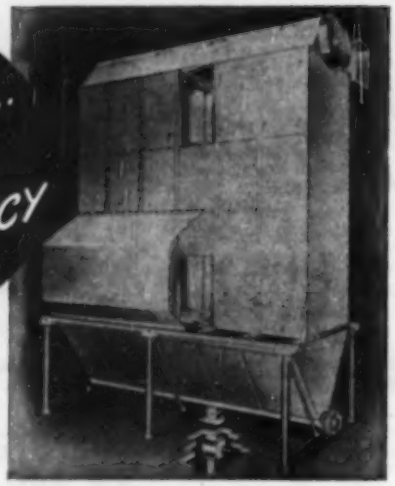

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& Rubber Co. and the U.S. Rubber Co., has an annual capacity of more than 60,000 tons of butadiene rubber. It is one of the larger plants of its kind in the nation, and will employ between 700 and 750 persons.

During the last war the Minnesota concern operated, under a joint contract with three other companies, the 30,000-ton National Synthetic Rubber Corp. plant at Louisville, Ky.

Officials of the 3M company, who are "hoping" the Torrence plant can begin operations November 1, say that workers for the project will be recruited from the Torrence area.

Electrode Plant Slated For $5 Million Expansion

Pending formal approval of arrangement with TVA for supply of power, National Carbon Division of Union Carbide & Carbon Corp. is considering a major expansion of its electrode plant at Columbia, Tenn. Company representatives state that this expansion, to involve an expenditure of over $5 million, is being undertaken to meet growing demand for large graphite electrodes used in the steel and metallurgical industries. It would add about $350,000 to the annual payroll of the Columbia plant.

Location of this expansion program in the South would be another step in the development of major industries in that section of the country.

This plant will have the most modern and efficient production facilities, resulting from National Carbon's extensive research and development activities. It is being especially designed to produce large graphite electrodes to meet present and future service demands of high-power furnace operations. Sizes will range up to and including 40-in. diameter by 110 in. long, weighing about 7,000 lb. each. It is expected this plant could begin producing graphite electrodes during the spring of 1951.

Fourth Yarn Plant Sparks Du Pont's Nylon Expansion

Its fourth nylon yarn plant will be constructed by E. I. du Pont de Nemours & Co., Inc., on a 635-acre tract located on the northeast bank of the Neuse River between Kinston and Graingers, N. C. The land is about six and a half miles northeast of Kinston and is adjacent to the main line of the Atlantic Coast Line Railway. It will take approximately 18 months to build the yarn plant, which will require about 1,200 people for its

operation after completion. Construction work is expected to start early next year.

The new North Carolina plant will be Du Pont's fourth nylon yarn plant, and the ninth major expansion of its nylon manufacturing facilities since World War II. The world's first plant at Seaford, Del., is being expanded at present, as is the plant that was opened at Chattanooga, Tenn., in

(Continued)

CONVENTION CALENDAR

National Metal Congress & Exposition, International Amphitheatre, Chicago, October 23-27.

Association of Consulting Chemists & Chemical Engineers, annual meeting, Shelburne Hotel, New York, October 24.

American Institute of Chemical Engineers, New York Section, symposium on management, Hotel Statler, New York, October 24.

Technical Association of the Pulp & Paper Industry, Alkaline Pulp Committee program, Hotel George Washington, Jacksonville, Fla., October 25-27.

Salesmen's Association of the American Chemical Industry, sales clinic, Roosevelt Hotel, New York, November 2-3.

Eighth Annual Pittsburgh Conference on X-Ray and Electron Diffraction, Mellon Institute, Pittsburgh, November 2-3.

Society of Rheology, New Yorker Hotel, New York, November 3-4.

Society for Applied Spectroscopy, echelles vs. gratings, Socony-Vacuum Training Center, New York, November 7.

Federation of Paint & Varnish Production Clubs, Congress Hotel, Chicago, November 9-11.

National Fertilizer Association, fall meeting, Edgewater Gulf Hotel, Edgewater Park, Miss., November 13-15.

American Petroleum Institute, Biltmore and Ambassador Hotels, Los Angeles, November 13-16.

American Council of Commercial Laboratories, Waldorf-Astoria Hotel, New York, November 14-15.

National Paint, Varnish & Lacquer Association, Fairmont Hotel, San Francisco, November 15-18.

American Society of Mechanical Engineers, Hotel Statler, New York, November 26-December 1.

American Pharmaceutical Manufacturers Association, midyear meeting, Waldorf-Astoria Hotel, New York, November 27-29.

19th National Exposition of Power & Mechanical Engineering, Grand Central Palace, New York, November 27-December 2.

Chemical Specialties Manufacturers Association, New Yorker Hotel, New York, December 3-5.

American Institute of Chemical Engineers, annual meeting, Neal House, Columbus, Ohio, December 3-6.

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1948. Both projects are scheduled for completion early next year.

Recently, Du Pont announced an expansion project for the plant at Martinsville, Va., which was built in 1941 and enlarged in 1945-46.

Immediately after the war, Du Pont completed a new plant at Orange, Tex., for the manufacture of nylon's basic chemical intermediates. Construction is under way on a new plant at Victoria, Tex., for the manufacture of additional basic intermediates, while capacity for other materials required in the production of nylon is being expanded at a unit of the Niagara Falls, N. Y., plant, which was built in 1947-48.

Continental Ups Capacity For High-Octane Gasoline

Continental Oil Co. will double its Lake Charles, La., oil refinery at a cost of about $10,500,000. Announcement of plans for the enlargement, which will raise the refinery capacity to 25,000 bbl. of crude daily, followed action by the Louisiana department of commerce and industry in granting a 10-year tax exemption for the project.

It also followed quickly on the heels of ground-breaking ceremonies at Ponca City, Okla., for a $2,250,000 laboratory to be built in conjunction with the company's refinery in that city.

Contracts for the construction of the Lake Charles refinery addition will be let this month and completion is expected early in 1952. The new units will be capable of producing high-octane aviation gasoline for the armed forces. Continental has contracted with the Navy to deliver between 3,000 and 4,000 bbl. of 115 to 145 octane aviation gas daily. A large part of this gasoline will be blended at and moved through the Lake Charles refinery.

The enlargement will mean more than 100 additional permanent employees added to the Lake Charles refinery.

Niagara Alkali Celebrates Its Fiftieth Anniversary

This year marks the Fiftieth Anniversary of the Niagara Alkali Co., according to J. Clarke Cassidy, president. Organized in 1900, under the name of the Roberts Chemical Co., Niagara has pioneered steadily in its field of electrochemistry, specifically in relation to chlorine and similar products.

A notable contribution of the company has been to public health by the chlorination of water supplies. On Nov. 22, 1912, it tried out the first successful apparatus for this purpose, in the City of Niagara Falls, which then had one of the highest death rates from typhoid of any city in the United States. Two years later, Niagara Falls was the envy of other cities as a healthy place to live. From this early beginning, the annual death rate from typhoid in this country has dropped from 25 per 100,000 to one-twentieth of that figure principally due to chlorination of drinking water, of which 75 percent is treated today in our country at a cost of less than a cent per person per year.

Niagara started with the ideas and some 30 patents of Isaiah L. Roberts, principal of which was an electrolytic cell diaphragm to withstand the destructiveness of basic chemical compounds in making caustic potash and bleaching powder.

The company, in addition to successful chlorination of drinking water, has a number of other firsts to its credit in this country. Principal of these is the successful introduction of

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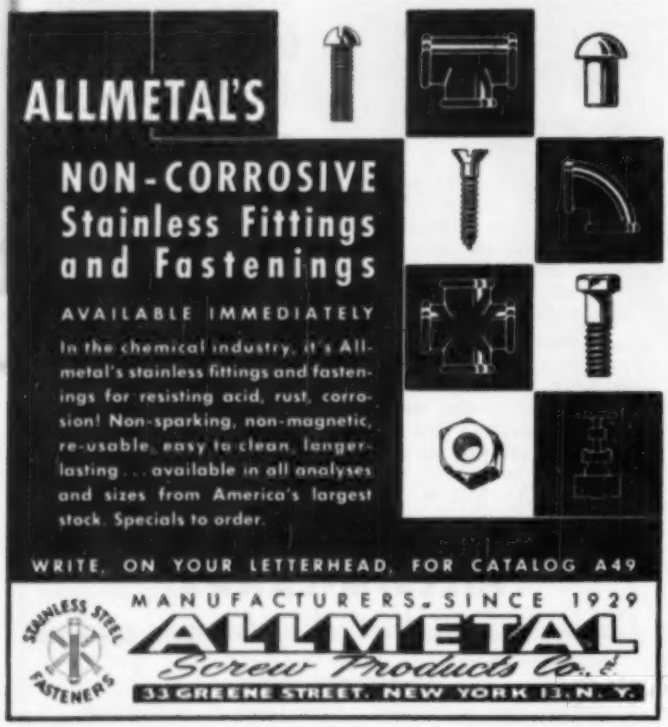
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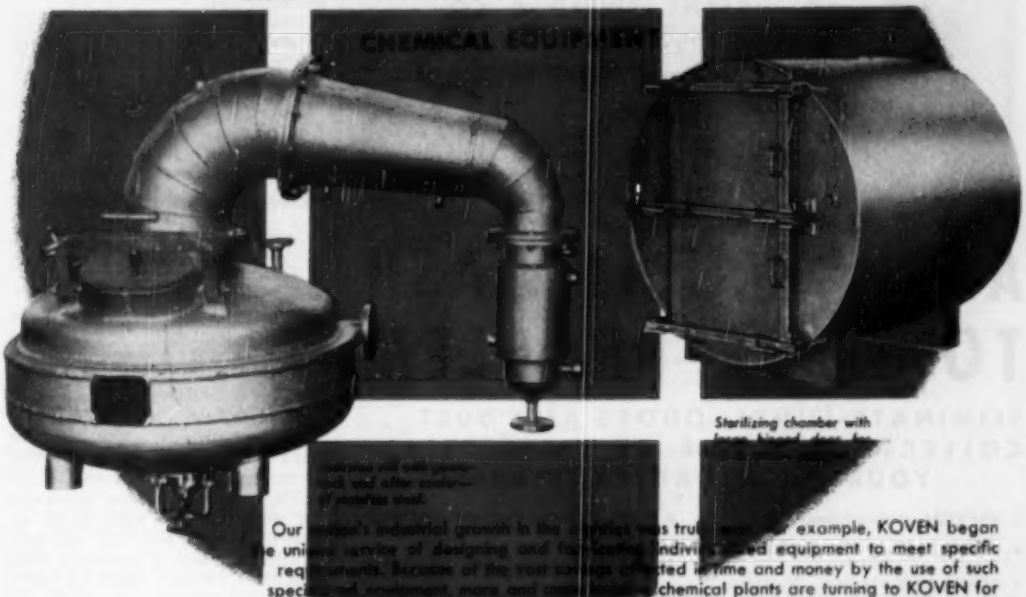

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liquid chlorine for bleaching cotton textiles. Former bleaching methods weakened the cloth. The company likewise was the first to manufacture synthetic caustic potash here.

Flaking of alkalis was introduced with the flaking of caustic potash just prior to World War I, as a means of meeting German competition for this product, which then sold only in fused, broken and liquid forms. Niagara Alkali was the first to produce potassium carbonate, while it also first supplied hydrogen from electrolytic cells, for use in making ammonia. It was one of the first to make monochlorobenzene and paradichlorobenzene.

Most recent addition to the company's list of chemicals, while not new, is trichlorethylene of high stability, largely used in metal cleaning and degreasing.

Principal officers of Niagara Alkali besides Cassidy are S. Willard Jacobs, vice president, Stephen J. White, vice president and treasurer, and William J. Weed, manager of sales.

Biggest Soybean Extraction Plant Finished in Illinois

Completion of construction on a new $5 million solvent extraction unit at Decatur, Ill., has given the A. E. Staley Manufacturing Co. the greatest soybean processing capacity of any single plant in the world.

Addition of the new unit to existing processing facilities gives the Staley company a total capacity for processing the soybean yield of more than 3,500 acres per day. The new unit has a capacity for processing 800 tons of soybeans daily.

The solvent extraction process is the most efficient known in the industry, and the new unit was constructed as a part of an over-all modernization program. Major products of soybean processing include the oil, which has a large number of edible and industrial uses, and the meal, which supplies the protein in livestock and poultry feeds.

Completion of the new unit also gives the Staley company the largest capacity of any single plant in the U. S. for processing soybeans by the extraction method. Its other Decatur facilities include an extraction plant built in 1945 and an older expeller plant.

Announcement of the completion of the new unit comes at a time when the U. S. Department of Agriculture has forecast a record national soybean harvest of 271 million bushels this

fall. The largest crop to date is the 223 million bushels harvested in 1948. Leading soybean growing states are Illinois, Iowa, Indiana, Ohio, Minnesota and Missouri.

The Staley company, which also processes corn, is the oldest soybean processor in the nation. It built its first soybean processing plant at Decatur in 1922. Its founder, the late A. E. Staley, Sr., pioneered the growth of soybeans by Corn Belt farmers. Illinois last year grew more than one-third of the nation's soybeans.

Company officials say the new extraction unit is intended as a replacement for the older expeller facilities. They point out, however, that future operation of the expeller unit will depend on economic conditions in the industry.

Already ranked as the nation's leading source of vegetable oil and protein meal for livestock and poultry feeding, soybeans loom more important than ever this year, according to Staley officials, because of an anticipated small cotton crop. The USDA predicts a cotton crop of 10,308,000 bales this year compared to 16,128,000 last year. Cottonseed is an important source of vegetable oil and meal.

General contractor on the new extraction unit was the H. K. Ferguson Co. of Cleveland. Major equipment was supplied by the Blaw-Knox Co.

The Staley company also announced recently plans to convert its expeller facilities at Painesville, Ohio, to the solvent extraction method. Work is scheduled to start on the new plant in January.

Citric Acid Price Frozen By Pfizer for One Year

Price of citric acid, a major chemical product, has been frozen for a period of one year by Chas. Pfizer & Co., world's largest producer of the commodity. This is the first major price-stabilization move to be announced in the chemical industry since the beginning of the Korean war. The company's guarantee not to raise the price of citric acid remains effective through Aug. 31, 1951.

According to John E. McKeen, president of Pfizer, the purpose is "to assure an adequate supply of citric acid at a stable price. It is our hope that this voluntary action will help serve as a brake on the current inflationary trend."

Industry leaders have expressed the opinion that the Pfizer announcement will have the effect of stabilizing the entire citric acid market, eliminating

(*Continued*)

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scare-buying and hoarding. Pfizer also set the pace in the industry at the beginning of World War II, by a similar price guarantee.

Citric acid, the most widely used organic acid in the food industries, is the standard acidulant in beverages, jams and jellies, and is extensively used in candies, gelatin desserts, drink powders and frozen foods. It also finds important application as an industrial chemical and in the manufacture of pharmaceutical products, such as Terrabon, the new elixir of Terramycin, first of the wide-range antibiotics to be prepared in elixir form.

Pfizer has been producing citric acid since 1880, when manufacture depended upon imported crude citrate of lime or concentrated lemon juice, the traditional natural sources. A program of research and development aimed at the production of citric acid by biochemical synthesis was initiated before World War I and culminated successfully at Pfizer in 1923, when citric acid was first produced commercially by fermentation methods. It was this development that led to American independence of foreign raw materials for the manufacture of citric acid and resulted in a considerable reduction of price. More recently Pfizer has made citric acid available in anhydrous form, which offers the advantages of lighter shipping weight, greater stability in storage and unvarying acid strength.

Since the end of World War II, Pfizer has greatly expanded its citric acid production facilities by adding a new plant at Groton, Conn.

Cat Cracker Being Added as Oklahoma Refinery Expands

An expansion and modernization program for the Cities Service refinery at Ponca City, Okla., will be commenced at once. From one to two years will be required to complete the program.

New facilities will include a catalytic cracking unit of latest design, a catalytic polymerization unit and a gas plant. The program also will include improvement of the vacuum flashing unit and treating processes, installation of a new water cooling tower, increased storage capacity for finished products, and additional steam, water and other facilities.

This expansion and modernization program is designed to increase the capacity of the refinery to provide for the normal growth of Cities Service Oil Co.'s marketing territories, to

(Continued)

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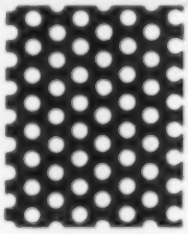

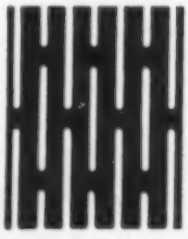

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increase the over-all efficiency of operations and to meet the ever-increasing demands for high-quality products.

The present crude processing unit will be revamped to provide a 33 percent increase in capacity, to 20,000 bbl. of crude oil daily. It will be operated in conjunction with the vacuum flashing unit, which will use residuum as feed stock and produce gas oil feed for the cat cracker and a product used in blending heavy fuels.

The catalytic cracking unit will be the fluid type and will replace the present thermal cracking units. The new unit will increase to five the total number of fluid cat crackers operated at Cities Service refineries. The Lake Charles, La., refinery has three such units, and a recently completed modernization program at the East Chicago, Ind., plant included another. Design for the expansion and modernization program was by M. W. Kellogg Co. of New York.

Monsanto Stepping up Its Activities in Isocyanates

Ethyl isocyanate is now being supplied by Monsanto Chemical Co. The company is one of the first to make isocyanates available to American industry.

Monsanto recently reduced the price on a related product, tolylene diisocyanate. At the same time it made the product available for the first time in 55-gal. drum quantities. The company has recently completed installation of enlarged facilities for the production of isocyanates at its Anniston, Ala., plant.

Other isocyanates that Monsanto manufactures are phenyl isocyanate, octadecyl isocyanate and p,p'diisocyanatodiphenyl methane, a new product.

The isocyanates, developed industrially by the Germans during the last war, are being increasingly used in the adhesives, paint, rubber, plastics and textile industries.

Fertilizer Chemicals Plant For International in Texas

Thirty acres have been purchased by International Minerals & Chemical Corp. at Fort Worth, Tex., from Consolidated Chemical Industries, Inc. It will be used for a new chemical fertilizer plant. The site on Fort Worth's north side is adjacent to the acid plant of Consolidated, which will be the source of supply of sulphuric acid, used in International's production of superphosphate.

The new plant when completed is expected to represent an investment

of $500,000 in land, buildings and equipment. It will have a capacity of 40,000 tons annually. Products of the plant, in addition to superphosphate, will include mixed fertilizers used in growing wheat, hay, corn, cotton, truck and pasture crops.

Koppers to Build Coke Ovens For Birmingham Company

Alabama By-Products Corp., which operates a large foundry coke and coal-chemical plant at Tarrant, Ala., near Birmingham, has awarded Koppers Co., Inc., a contract to construct a battery of 29 new chemical-recovery coke ovens. Engineering work will begin at once, and the new battery is expected to be completed within a year.

The new coke oven battery will consist of 29 Koppers, Becker-type ovens, underfired with coke oven gas. At 20 hr. coking time, they will produce 150,000 tons of coke annually. Alabama By-Products Corp. now has a total of 174 ovens, and the new battery will bring the total to 203.

Koppers also will furnish new coke oven machinery and will build an ammonia absorber for the Birmingham company.

P. H. Neal, president of Alabama By-Products, says that construction of the new battery is "deemed necessary in the light of the war in Korea and the developing long-term rearmament program."

Du Pont Boosts Capacity For Tetraethyl Lead

The Petroleum Chemicals Division of the Du Pont company announces that expanded facilities for manufacturing its tetraethyl lead antiknock compounds for gasoline will be in production before the end of the year. The new manufacturing units, which are now approaching completion at the company's Chambers Works, Deepwater Point, N. J., will raise its capacity for making tetraethyl lead by one-third.

Construction of the new equipment originally was started to make it possible for the company to meet normal expansion of its tetraethyl lead business. This program was considerably accelerated because of the Korean war.

Newsprint and Kraft Mill in South to Cost $40 Million

A $40 million newsprint and kraft paper mill is to be constructed at Butler, Ala., by the Choctaw Pulp & Paper Co., in another southern pub-

(Continued)

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This tube is made up of three centrifugally cast sections, each about 9 feet long and welded together to make a total length of some 27 feet. The wall thickness is ½ inch.
Centrifugally cast alloy steel is exceptionally uniform, strong and close-grained. More and more it is being used for process work where high strength and safety coupled with heat or corrosion resistance are required. And a big share of the industry's centrifugal casting tonnage is coming from the same Duraloy high alloy foundry that produced this gas generator tube.
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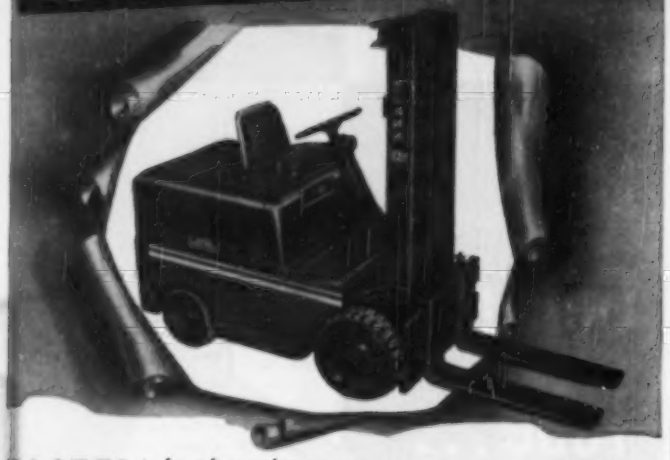

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lisher-owned cooperative venture, it is announced by Paul D. Hammacher, president.

Plans for the new newsprint mill call for estimated output of 200,000 tons of newsprint and 16-point kraft board annually. This will be divided equally between the two products. Newspapers in the South and Midwest are expected to take the output of newsprint, and midwestern paper box manufacturers to use the kraft board.

San Jacinto Ammonia Plant Taken Over by New Company

A new company, the San Jacinto Chemical Corp., has been organized to operate the former San Jacinto Ammonia Works at Houston. This plant had been operated by Hercules Powder Co. until the expiration of its contract about August 1. The R. S. Mueller Co. of Baltimore, Md., which leased the plant from the government, assigned the lease to the operating company. R. F. Hopkins is vice president and treasurer of the San Jacinto Chemical Corp. and local manager.

The 70 ton per day anhydrous ammonia plant was moved to the San Jacinto Ordnance Depot ground on the Houston Ship Channel a year ago. It had formerly been at Louisiana, Mo.

Cat Cracker Goes on Stream As Modernization Nears End

Major units of the modernization program at Deep Rock Oil Corp.'s Cushing, Okla., refinery are completed with the new cat cracker on full stream. The new equipment will increase the refinery's daily crude capacity from 12,000 bbl. to 18,000 bbl.

Included in the modernization building are a fluid catalytic cracking plant, a crude oil topping unit, research and development laboratories and refinery auxiliary units.

The cat cracker includes a feed preparation unit, cracking reactor-regenerator, fractionating section and gas concentration unit, and will be able to process more than 5,000 bbl. of crude cracking stock daily into high-octane gasoline while producing as byproduct relatively small quantities of low-value railroad fuel in contrast to older thermal cracking methods.

Atlas Increasing Capacity For Production of Sorbitol

Expansion of the sorbitol plant capacity at Atlas Point, Wilmington, Del., is announced by Isaac Fogg,

president of Atlas Powder Co. Capacity of the sorbitol units will be increased by nearly 50 percent and the new increased production will start this month.

Atlas first started making sorbitol in commercial quantities at Atlas Point in 1937. In 1947, a new sorbitol plant was built at a cost of over $3 million.

Sorbitol is an alcohol belonging to the same chemical family as glycerine, and is used for many of the same purposes as glycerine, although it possesses many unique properties of its own. It is used to help control the moisture content of many products such as tobacco, cork, paper, cosmetic creams and lotions, gelatins, glue, tooth paste and candy. It is the principal source material for making vitamin C, and Atlas also uses sorbitol to produce emulsifiers and other surface active agents.

Citric acid plant, together with a steam boiler plant, will be constructed in Elkhart, Ind., for Miles Laboratories, Inc., by E. B. Badger & Sons. Miles is a major user of citric acid. The new plant will use a fermentation process developed by the Miles research laboratory. Completion is scheduled for the summer of 1951.

Safety award of the Liberty Mutual Insurance Co. has been presented to employees of International Minerals & Chemical Corp.'s Florida Phosphate Division for operating five years with 25 percent fewer accidents than the national average for the industry.

Plastics fabrication research will be the concern of a new plastics basic research group recently formed at the Midland, Mich., laboratories of Dow Chemical Co. The new group, headed by Robert S. Spencer, hopes to improve the speed of fabrication or quality of the product by better understanding of fabricating processes. New methods of plastics fabrication will be studied as well as methods now in widespread use.

Chlorine barge is being constructed by Dravo Corp. for Columbia Chemicals Division of Pittsburgh Plate Glass Co. Specially designed for transporting liquid chlorine, the new 175-ft. barge, 26 ft. wide and 10½ ft. deep, will contain six cargo tanks for chlorine. The eight original chlorine barges built by Dravo for Columbia three years ago were the first of their kind. Use of the barges means cheaper bulk deliveries of the chemical to consuming plants along the inland waterways system.

—*End*

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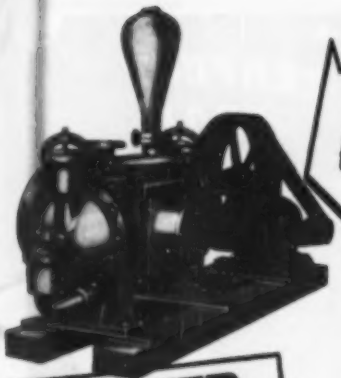

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SHOW AT CHICAGO

(Continued from p. 135)

ber of radial arms which bear on the inside of the casing. At two opposite points the casing is "pushed in" by two "squeezers." As the impeller rotates the arms are correspondingly pushed toward the center at these points. Before each squeezer is an outlet, and after it an inlet, so that there are two inlets, two outlets. The idea is that an impeller of given size thus does double duty and gives twice the delivery at any given speed, compared with the usual arrangement.

INSTRUMENTS FOR CONTROL

Beckman Instruments, Inc. (formerly National Technical Laboratories), showed new pH electrodes for extremes of temperature and alkalinity. The company's latest infrared spectrophotometer, which can now be hooked up to a recorder, was also on display. Although it is primarily a laboratory instrument, its new automatic titrator was being offered for plant control use since its operation for routine titrations requires no special training. The endpoint is determined potentiometrically.

The Titrilog, Consolidated Engineering Corp.'s automatic continuous recorder for oxidizable sulphur compounds such as H_2S, SO_2 and mercaptans, has now been brought out in a second, portable model. It is claimed that no operational advantage has been sacrificed in making the instrument portable. Like its earlier prototype, the new model operates on the principle of an oxidation reaction with electrolytically prepared bromine, titrating automatically to a potentiometric endpoint. A second new instrument shown by this maker was the Micromanometer which is an accurate and sensitive device for pressure measurement in the 0-150 micron range. Readings cover pressure of both condesible and non-condensible gases in the system and are independent of the gas composition, eliminating need for special calibration. The novel principle consists in employing a pressure-sensitive condenser with a stainless steel diaphragm as one of the plates. This condenser forms one arm of a capacitance bridge which is kept in balanced condition by applying an electrostatic restoring force to the diaphragm as a pressure differential across the diaphragm tends to upset it.

Newest development of the General Electric X-Ray Corp. is a new automatic X-ray diffraction unit of the spectrometer type, with a recorder

for the results. Precision Scientific's Precision-Dow Robomatic refractometer was another of the new plant instruments shown. This device measures and records the composition of process liquids in terms of refractive index. It can readily be adapted to automatic control. In the Wheelco booth were several recently introduced industrial instruments. The Capacilog electronic millivoltmeter recorder for temperature and other variables is now made with a pneumatic control end. The same maker is now offering a time-temperature program controller.

SEPARATION EQUIPMENT

One of the most recent of the dust filter makers to develop a filter under the Hersey patent is the Day Co. This filter is of the multi-tube type with the blow-back carriage carefully guided to assure parallel operation at all times. In tests on radioactive dusts these filters have shown efficiencies of 99.95 to 99.998 percent at loadings up to 32 grains per cu. ft. and air-cloth rations of 16-27 cfm. per sq. ft.

A new dust collector based on the multiple, small-diameter cyclone principle was exhibited by Dustex Corp. Exceptionally high collection efficiency is claimed on all sizes of dust, with 100 percent collection on 14 micron dust of 2.5 sp. gr. at 4 in. w.g. pressure. Use of a turbulence-free inlet manifold and controlled helical flow within seamless cyclone tubes is credited for these results. Individual tubes are rated at a capacity of 63 cfm. at 70 deg. and 4 in. w.g. operating pressure. These collectors may be made of any weldable metal.

Niagara Filter Corp.'s Auto-Sluice pressure leaf filter, which was originally introduced at the Chicago Show two years ago, has since been much refined and now can be provided with full automatic cycle control. Formerly available only up to 500 sq. ft. of filter area, filters of twice this size can now be provided. Among the design improvements is the use of a cone bottom instead of a dished bottom for better discharge of the sluiced-off solids. The new filter can go through all steps from filling through sluicing and solids discharge without attention from the operator.

In the Podbielniak display was evidence that this concern's line of centrifugal countercurrent contactors for continuous liquid-liquid extraction has not only been expanded to both larger (20,000 gph.) and smaller (500 cc. per min.) sizes, but also to models capable to handling suspended solids. In antibiotic manufacture, for example, this means that the whole broth.

(Continued)

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In the meantime, we have been continually developing new improvements on these "Steamboilerplants", so that the McKee SUPER-MATIC you get today is even superior to those that have been making these excellent records.
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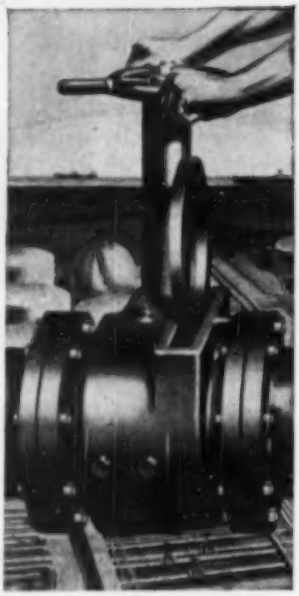

When Hamer Line Blind Valves were introduced years ago, the old expensive and hazardous way of blinding pipe lines with a spectacle bolted between companion flanges became obsolete. The Hamer family of positive, one-man operated line blinding units has now grown until there is *a Hamer Line Blind Valve for every application*—EVEN FOR BLINDING RIGID LINES where no endwise movement is possible.

The new "RIGID" Line Blind Valve solves the problem of blinding inflexible lines in refineries, process plants, tankers and other ships...wherever rigid piping installations must be opened and closed. *It's speedy and cost-cutting*—one man can reverse the plate in one minute. It's *safe*—enclosed plate slot prevents spilling line fluid. *It's positive*—there's nothing like a solid plate for a permanent, leak-proof shut-off.

Positive shut-off without pipe line movement!

Actuated by the hand wheel, a smooth-turning ball bearing mounted ring gear moves the sliding internal sleeve in a straight line to clamp and release the plate, eliminating the need for spreading the line. "RIGID" Line Blind Valves conform to A. S. A. Standards for face-to-face dimensions of steel wedge gate valves. In planning new layouts, or modernizing existing installations, use a gate valve for blocking but specify Hamer "RIGID" Line Blind Valves at every point where quick, one-man operated, POSITIVE SHUT-OFF will be required.

LEFT—"RIGID" LINE BLIND VALVE

RIGHT—SPOOL-TYPE LINE BLIND VALVE

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Illustrated below are: 1—Spool-Type, side hand wheel. 2—Spool-Type, upright hand wheel. 3—"Tee" and "Ell" Type. 4—Economy 3-Bolt Type.

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Non-Stick PLUG VALVES
OIL TOOL COMPANY
2919 GARDENIA AVENUE, LONG BEACH 6, CALIFORNIA

without prior filtration, can be extracted and the solids washed in two steps, both in centrifugal contactors.

Two of its recent developments in separation equipment were exhibited by the Prater Pulverizer Co. The first was a two-stage air classifier for accurately fractionating solid particles into coarse and fine. The use of the second stage is said to reclaim an additional 10 to 15 percent of fines from the coarse fraction. Adjustments of the two stages by the admission of secondary air at strategic points are said to give complete control over the separation. The other new development is a wet-type dust collector produced in two main types. One type has a number of ceramic packed beds in a vertical cylinder and a central spray pipe for wetting the dust particles. The other type also uses packed beds as the last separating stage, but precedes them with several stages consisting of throats in steel decks through which the dust laden air must pass again powerful sprays.

A new pressure filter was exhibited by the Sparkler Mfg. Co. Known as the Dual Disk filter, its construction is simple, enabling up to 1,000 sq. ft. of surface to be incorporated into a portable unit. Filter elements consist of two dished screen disks secured together at their outer edges to provide drainage space inside. These are clamped together on a vertical center spindle, alternating with peripheral separator rings which seal the filter paper disks at the outer edges. The whole assembly is in a pressure tank. Feed enters the filter elements through openings in the separator rings, filtrate draining out through the spindle.

Otto H. York Co.'s booth featured laboratory and small production sizes of the York-Scheibel liquid-liquid extraction column developed by E. G. Scheibel of Hoffman-LaRoche. The column consists of sections packed with wire mesh fabric, alternating with void sections containing an agitator. Mixing of the two immiscible phases takes place in the agitator sections, and separation by gravity in the packed sections. Up to 40 or 50 extraction stages can thus be obtained in a single tower, giving extremely high extraction efficiency.

OTHER EQUIPMENT

Materials Handling—A device for the continuous feeding of solids into equipment operating under pressure or vacuum (or removing the material from such equipment) was exhibited under the name of Pneumatrol by Hapman Conveyors. This company's

conveyors consist of a series of circular flights carried on a chain or cable and pulled through a cylindrical pipe. The Pneumatrol is a short pipe section containing a flexible rubber sleeve which is forced against the flights by air pressure so as to form a tight seal. Another concern showing a new piece of materials handling equipment was Link-Belt Co. The new Positive Action oscillating conveyor is a trough type in lengths up to 100 ft., with mechanical oscillation. It is driven by a fluid-drive motor through an eccentric mechanism. The trough is carried by supporting arms attached to torsion bars which act as reactor springs to absorb the energy of trough movement at each end of the stroke.

Mixing—National Engineering Co.'s new Simpson Porto-Muller was featured in that concern's booth. This is a muller type mixer carried on pneumatic-tired wheels, complete with a 3-hp. motor. The mixer is readily portable, yet handles 250-300 lb. of material per charge. Another mixer, the P-K twin shell blender for dry materials, was exhibited by Patterson-Kelley Co. Two cylindrical vessels intersect at 90 deg. and are mounted symmetrically on a horizontal axis with their axes at 45 deg. to the ground.

Ultrasonics—Brush Development Co. showed its laboratory and pilot plant size ultrasonic generators, known as Hypersonic. The vibrating element or transducer is a focussed ceramic which has the property of acting like a piezoelectric crystal but can be made in large sizes for dissipation of considerable amounts of energy. The pilot plant model, for instance, puts out energy of 1,800 watts in various frequencies from 125 to 1,000 kc.

Grinding—W. J. Fitzpatrick Co. showed a small hammer mill (Comminutor) equipped with a newly developed water-jacketed top and automatic screw feeder. Pulverizing Machinery Co.'s new development was a special Mikro pulverizer known as the No. 1 SP, similar to the older No. 2 SP, but considerably smaller, it is intended primarily for pharmaceutical plant use in grinding plastic type materials containing liquids, such as pill granulations. The mill is screenless and has a revolving drum in the lower part to assist discharge.

Safety Equipment—Its new gas mask for canister or compressed air use, equipped with wide-vision welding lenses, was featured by Acme Protection Equipment Co. It is for use by welders operating in hazardous atmospheres. The welding lenses are hinged for easy opening, exposing the regular clear lenses of the mask.

—*End*

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Fire damage to transformers can seriously curtail plant operations and result in high cost equipment losses and out-of-service time. That's why you'll be using good judgment when you make sure that your oil filled power generating equipment is safe from fire 24 hours a day, every day of the year.

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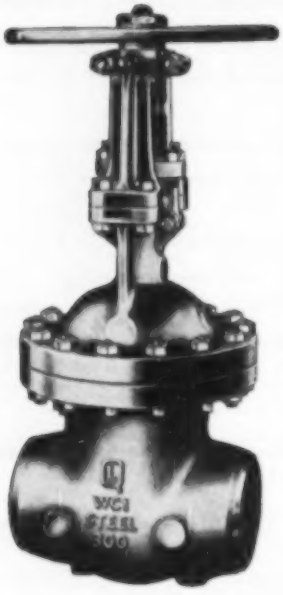

Well, there are "alternates." But the engineer's familiar specification, "Lunkenheimer Figure 1938 or equivalent," invites a comparison with your thumbprint — and your neighbor's. How "equal" can valves really be? A few characteristics can *almost* be matched. But there is no equal for most Lunkenheimer features. Consider the metal quality of Lunkenheimer steel castings. Their soundness is unparalleled in the valve field. Lunkenheimer metallurgical research has uncovered whole new areas of study, developed exclusive alloys, pioneered in methods of quality control. The amazing records of safety and long service life achieved by Lunkenheimer steel valves are evidence that there *is* no real equivalent for Lunkenheimer metal quality. In workmanship, too, the famous Lunkenheimer tradition of care and precision has never been equalled. New machines (most of Lunkenheimer's machinery is less than three years old) are making possible *even higher* standards of workmanship. The *only* equivalent to a Lunkenheimer steel valve is another of the same design —a Lunkenheimer. For the address of your nearest representative, and for more steel valve data, write to The Lunkenheimer Co., P. O. Box 360P, Cincinnati 14, Ohio.

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LUNKENHEIMER

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The Human Equation

RICHARD L. DEMMERLE, *Associate Editor*

A Foreman Needs Two Heads but One Mind

Back in the days when the president of a company was able to know the name and the personal strengths and failings of each of his employees, the lines of communication between management and workers were short, and clear. It was an era of management by direct command in which memos and orders seldom had to travel more than the few hundred yards that separated the owner-boss's door from the nearest drill press or reaction kettle. In fact most executive orders were barked from that door and it merely remained for the foreman to see that they were carried out.

But in the large industrial organizations of today, the foreman has a much bigger and more critical job. To the worker he is the company itself because he is usually the only means of contact the worker has with the organization. And although the corporate type of enterprise has much to recommend it, in the last analysis it is much easier for an employee to feel a personal loyalty to one familiar, immediate superior than it is to a remote management and thousands of faceless stockholders.

For this reason the relationship the worker has with his foreman is the most important determinant of the degree of satisfaction he finds in his job. If the foreman is competent and is granted the proper authority and respect by management a feeling of "belongingness" will arise in the workers that serve under him. They will have a leader from whom they can take deserved reprimand and expect earned praise. But if the foreman is "rotten," the company is "rotten" in the worker's eyes. And under these circumstances even a "rotten" union will look wonderful by comparison.

Because he spans the worker-management gap, the effective foreman must think in two heads. In the first he must remember his own days in the ranks and the on and off the job problems that worried him then and now worry the men under him. In the second he must understand the role his section or department plays in the over-all function of the company and seek to improve its performance in that role. And in the mind that is generated in both these heads he must think and feel in terms of basic leadership. For although foremen once led by working, . . . today they work by leading.

The change of role of the foreman from that of a straw boss to a tactical leader reflects the new attitude of management toward its first line supervisors. This new outlook is well pointed up in a survey made on the subject by *Supervision* Magazine with the cooperation of Industrial Relations Methods Inc, a well known consulting firm on problems of human relations in industry.

The results of the survey were tabulated for 100 organizations, representing a quarter of a million employees and 11,000 men in supervisory positions. The size of the organizations ranged from 100 to more than 18,000 employees and 41 of the companies had 1000 or more workers. Chemical process companies constituted a major portion of the companies surveyed.

Perhaps the most striking set of facts uncovered by the survey was the amount of privileges, benefits and authorities which the companies grant to their supervisors. In decreasing order of frequency these were:

1. Vacation and sick leave benefits comparable to salaried personnel.
2. Pay during temporary shutdowns.
3. Major responsibility for hiring and firing.
4. Offices for foremen.
5. Not required to punch time-clocks.
6. Company social or club organization where foremen and plant executives meet.
7. Special recognition or awards for years of service.
8. Special parking privileges.
9. Special pension and retirement plans.
10. Profit sharing.
11. Annual medical examination.
12. Special eating place in plant.
13. Foremens' lounge and rest room.

Evidently this granting of management privileges to foremen has paid off well in the companies who practice it. The survey showed that 71 of the 100 companies reporting said that they believe that 70 percent of their foremen now have a real feeling that they are part of the management. And what's more, they claim that 10 to 20 percent of their foremen have potentialities for development into executive positions.

Perhaps some of this new attitude by management toward its foremen is the result of the sincere effort that top brass is making to get to know lesser brass. The survey revealed that over 64% of the presidents or operating vice-presidents of the companies polled take active measures to keep in close touch with first line supervisors. Many do this by means of informal get-togethers.

The ratings which the various companies in the survey gave their foremen also provide an interesting clue to the new management slant toward the stature of supervisors. Ninety of the companies surveyed rated their foremen anywhere from average to exceptional, only ten placing some of their foremen in the "doubtful" category.

Also of interest are the facts the survey found in the "what's wrong with foremen" side of the picture. Executives listed seven major shortcomings of their foremen in the following decreasing order of importance:

1. Not being management minded.
2. Poor skill in human relations.
3. Lack of personal effectiveness.
4. Poor work habits.
5. Unwilling to assume responsibility.
6. Lack of adaptability.
7. Lack of knowledge and information.

The full blame for these defi-

(Continued)

ciencies, however, rests squarely with top management itself. Either it was not painstaking enough in its choice of supervisors in the first place, or it provided no means for the training and development of the foremen it selected. The survey showed, for instance that only 38 percent of the companies had a semi-annual, annual or periodic personnel rating or review method with regard to foremen. And of all the major executives reporting only 24 percent were able to name a company (their own included) that was doing a thorough job in selecting, training and developing foremen.

Finally the survey popped the question to management; "On what topics would you like to have published articles made available to foremen?" The five most preferred topics were:

1. Practical methods in human relations and how to obtain the cooperation of others.
2. Create desire to learn.
3. Technical information about manufacturing methods or products.
4. Explain our economic system.
5. Information on controls (inventory, production, quality).

A second glance at the above topics will show they all are bent toward the development of an understanding of the basic principles of management . . . a working knowledge of the technical and economic aspects of production and a real savvy of human relations, the biggest factor in any job of leadership.

The foreman gets his greatest opportunity to establish a good human relationship with a worker during the period of indoctrination of the "new-hire." A wrong move or word on the part of the supervisor at this time creates a bad impression in the mind of the employee that may never be dispelled. During the first weeks on a job the trainee draws heavily upon the experience and patient kindness of the supervisor for orientation in strange surroundings. The employee must be supplied, not left to find for himself, the following type of information:

1. Knowledge of safety rules.
2. Location of first aid station.
3. Factory regulations-smoking, fire drills, absences.
4. Locations of lunchroom, lockers, and washrooms.
5. Time-clock and clock-card rules.
6. Rules regarding passes-temporary and permanent.
7. Departments of the organization.
8. Names of supervisors.
9. How wages are figured.
10. Benefit and pension setups.

Although the personnel department may have already given the new worker a formal outline of the above information he will get a much better grasp on the situation by hearing the facts informally from his new boss. By the same token an off-the-job chat with his supervisor after the first week of employment, can go a long way in clearing up any lingering questions or worries the tenderfoot may have about his new position. Over a cool glass of beer the foremen can give the neophyte such inside dope as "don't let Bill's (fellow worker) gruffness get you down. He's a good worker but he's had some personal trouble lately and he vents his spleen on the job."

The other big responsibility of the supervisor in which an ill chosen word or action can cause havoc is in the administration of discipline. Although disciplinary codes vary from company to company, as well as the amount of authority vested in the foremen to enforce them, the following cardinal rules regarding the adminnistration of discipline should be universal:

If your problem is

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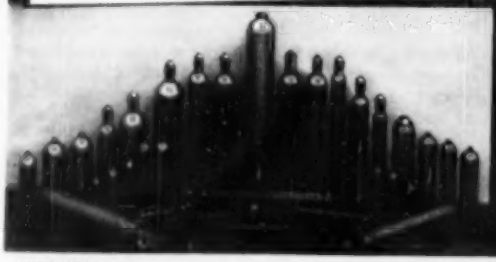

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1. Be fair and reasonable-allow for human shortcomings.
2. Teach and correct-never punish.
3. Discipline in private-never before fellow workers.

To a certain extent advisory criticism in small and infrequent doses is accepted by workers as part of the makeup of any job situation. But when too much discipline is required in any case the chances are that the individual does not belong in the group.

The majority of industrial concerns believe in the use of a written code of discipline as a guide to supervisors. There has been a noticeable tendency in recent years, however, to get away from presenting this code in a detailed manner. The main emphasis is placed upon the phrasing of general principles. This gives the foreman the leeway to judge each case in its own light and make his recommendations to management on a human rather than a statute basis.

But in any situation requiring a decision on disciplinary action the foreman should make a concerted effort to determine just what it was that caused the worker to deviate from the acceptable standards of conduct. The results may contain a clue to an unwholesome working condition or human-based problem that may in the future affect several additional workers. On the other hand they may expose a weak spot in the selection system by which the worker was originally screened.

In one study of 4,174 discharge cases, personal characteristics (insubordination, unreliability, absenteeism, and tardiness) were found to be the cause of 62.4 percent of the discharges, whereas 34.2 percent of the terminations were due to a lack of ability to perform a job satisfactorily. Whatever the cause of the severance it invariably leads back to a failure by someone, somewhere to measure, develop and adapt human qualities to productive effort.

It is, therefore, a wise management that endeavors to make the foreman feel that he is its on-the-spot representative in the conduct of human relations. But it is a wiser one still who will hear and act on his suggestions to improve the comfort and working spirit of "his" men. For in the strongest sense, first line supervisors are the non-commissioned officers of the industrial army. And as any military man will agree its the non-coms who make an army run.

Next month "The Human Equation" will present some proved-in-practice means of selecting and evaluating first line supervisors. —*End*

Let National Filter Media PREPARE YOUR FILTER COVERS

In our two fully equipped plants at New Haven, Conn. and Salt Lake City we are prepared to convert all types of NFM Filter cloth to fit all types of industrial filter elements. Three of the many standard covers available are illustrated here.

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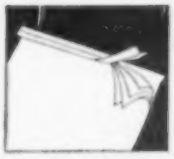

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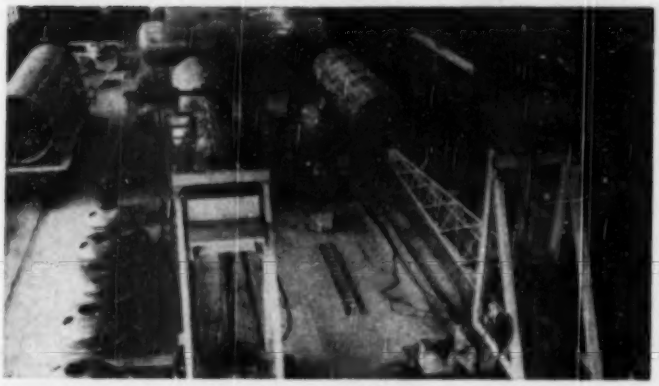
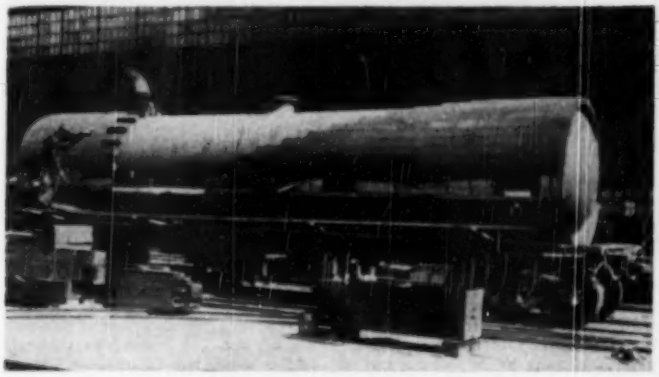


FABRICATING tank is first step in getting bulk liquids to market.



INSULATING materials are needed on cars handling some chemicals.

RESIN LININGS are sometimes used to maintain product purity.

Packaging Notebook—VI

TANK CARS

First tank car to be placed in service consisted of a flat car on which several wooden vats were mounted. This equipment demonstrated the economies to be obtained from bulk shipments with the result that more and more commodities have been transported by this means. The consistent improvements in tank cars made by manufacturers played an important role in increasing the use of this type of equipment.

The modern tank is fabricated of steel, aluminum, or stainless steel. Steel tanks may be clad with nickel or stainless steel, or they may be lined with rubber or one of a variety of resin linings specially chosen for a specific application. They carry dry materials as well as liquids and some of these cars are specially designed so that they can be loaded and discharged without contaminating the lading. Cars are constructed of one or more compartments. They can be insulated and equipped with steam heating coils. Some are designed to carry gases and liquids which have high vapor pressure at atmospheric temperatures.

There are now approximately 30 approved types of tank cars which are designed through variations in the details of construction to carry approximately 400 different commodities.

The use of aluminum is second only to steel in volume in the construction of tank car tanks. The first car placed in experimental service in January 1929 to transport glacial acetic acid is still in use. The tank was fabricated of 3S aluminum, it was gas welded and had a capacity of 8,000 gal. There are now over 1,000 aluminum tank cars in service and substantial orders for additional cars are awaiting fabrication. The accompanying tabulation shows the commodities carried in these cars as well as the types of aluminum used to fabricate the tanks. Types 2S and 3S are the relatively purer grades while types 51S and 61ST have greater tensile strengths.

In 1949 a fully automatic welding process was adopted by General Ameri-

(Continued)

WHEN YOU THINK OF

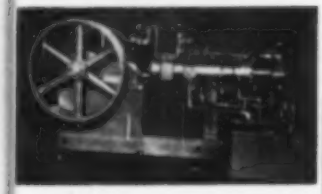
HIGH PRESSURE

THINK OF

NORWALK

COMPRESSORS

SIX STAGE COMPRESSOR



Norwalk high pressure compressor on steel base. The six stages develop a pressure of 20,000 pounds. Among the features of this and all Norwalk compressors are ample cooling system, accessibility of all wearing parts, and long service life.

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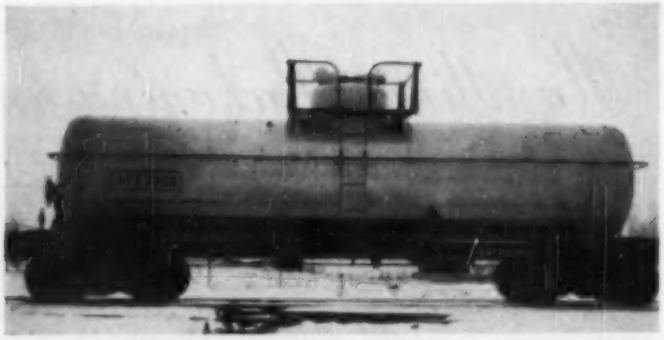


Special alloys, such as the stainless steel used in this car, are sometimes used to beat corrosion and contamination problems.

PACKAGING, *cont.* . .

can Transportation Corp. This is a shielded arc weld process. The arc is established by means of the aluminum filler rod and is shielded from the atmosphere with argon gas. Plates of 1/4 in. thickness are welded by this process. Certain parts of the tanks, such as sumps, coil brackets and fittings must be welded by the heliarc process because this work is not suited to automatic welding. X-ray is used to check the efficiency of all welds.

The dome reinforcement saddle of the General American tank has been considerably improved. This saddle, pressed to the contour of the tank shell, has a 54 in. inside diameter flued section in the center forming the base of the dome and to which the dome shell and head are butt welded. The advantages of this construction are (1) one piece reinforcement of this joint (2) no welding at areas of high stress (3) a dome without pockets or ledges to restrict dome drainage. Other features include ellipsoidal tank heads and the use of stainless steel or other alloys in fittings or other parts to which the use of aluminum is not ideally suited.

All stainless steel tank car tanks are often used for transporting nitric acid. They must be fabricated according to ICC 103C specifications. For specific application, tanks can be clad with nickel or with chromium-nickel alloys.

Linings are now frequently used to protect products from contamination as well as to prevent corrosion of the interiors of the tanks. These linings may be of rubber, synthetic resins such as phenolics or vinyls, varnish or other types. Tanks are usually sandblasted before application of the synthetic resin coatings. Each coat must be baked at temperatures of over 300 deg. F. Generally, five to seven coats are used, but where required, over 20 coats can be applied. Linings cost from $250 to over $2,500—the rubber linings are the most expensive.

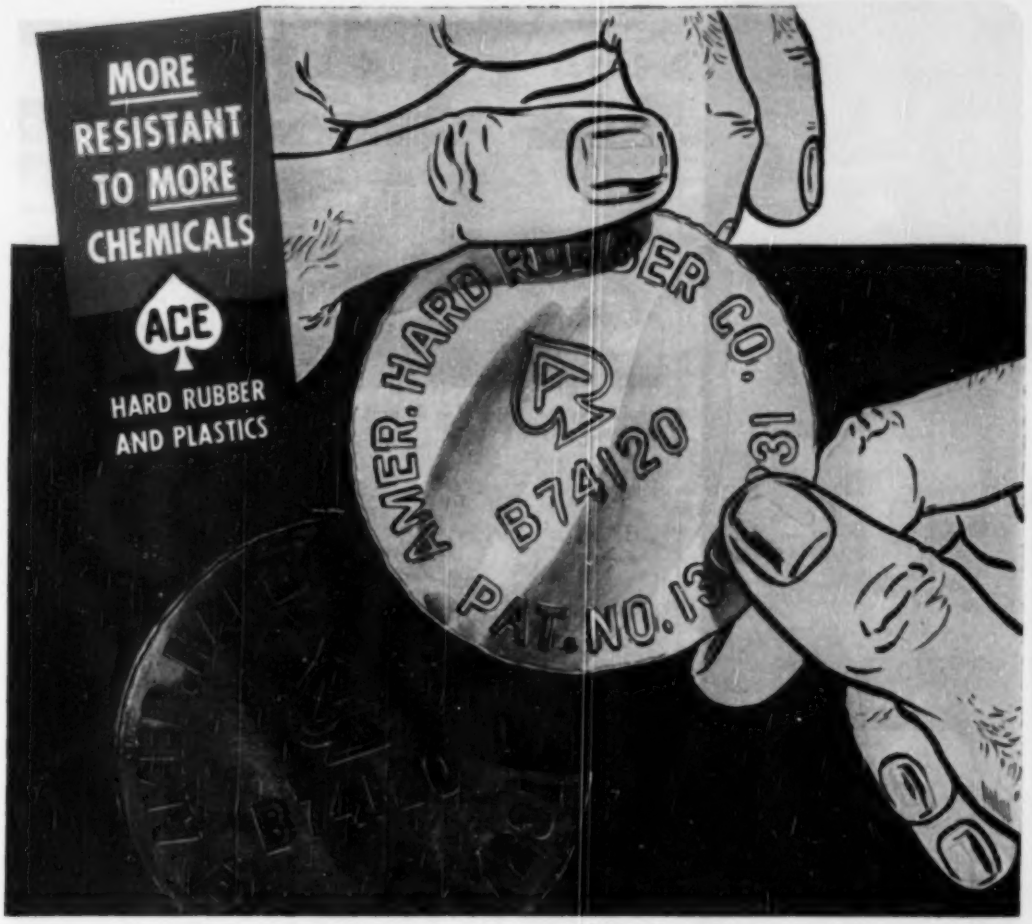
Tank car manufacturers are equipped in their laboratories to test the resistance of their linings. These tests as closely as possible simulate transportation conditions.

Where required to prevent contamination, standard covered hopper cars having capacities of from 1,300 to 3,000 cu. ft. can have their interiors coated with resin linings or they can

(*Continued*)

Pick your car needs from this list

Classification	Description	Tank, Psi.	Valve or Vent, Psi.	Typical Commodities
ICC-103	General service	...	25	Gasoline, vegetable oils, coal tar oils, etc.
ICC-103A	Acid cars	...	30	Sulphuric acid
ICC-103B	Hydrochloric acid cars	...	30	Formaldehyde, hydrochloric acid, phosphoric acid
ICC-103C	Nitric acid cars (alloy steel)	...	45	Nitric acid
ICC-104	Insulated car	...	25	Casinghead gasoline, asphalt, tar
ICC-104A	Pressure car-insulated	100	75	Butane, ethylene oxide
ICC-105A300	Forged lapwelded steel tanks	300	225	Propane, anhydrous ammonia
ICC-105A400	Forged lapwelded steel tanks	400	300	Liquefied petroleum gases having V. P. less than 300 psi. at 105 deg. F.
ICC-105A500	Forged lapwelded	500	375	Chlorine, sulphur dioxide
ICC-105A600	Forged lapwelded steel tanks	600	450	Liquefied petroleum gases having V. P. less than 450 psi. at 105 deg. F.
ICC-106A500	Multiple unit forged welded tanks which are removable for filling and emptying	500	375	Chlorine
ICC-107	Multiple unit hollow forged or drawn tanks	Depends upon commodity		Helium, hydrogen
AAR-201-A-35	Riveted aluminum tank	...	75	Fatty acids, acetic acid
AAR-203	Riveted steel tanks	...	65	Non-regulatory commodities (wine, creosote, tall oil)



A CRAFTSMAN SIGNS HIS WORK

SOMEWHERE in every ACE rubber-protected tank you'll find this seal. It's embossed into the rubber by a skilled American Hard Rubber Company lining craftsman just before the tank goes into the vulcanizer.

The serial number tells the age, and an amazing number of old ACE tanks are still in service after years and years of trouble-free handling of acids and alkalies.

The laboratory-controlled quality of the rubber and the ACE two-layer lining process (shock-resistant soft rubber plus chemical resistant hard rubber) get part of the credit. No less important is the craftsmanship of the men who cement the bond—the men who roll the perfect seams—the men who "sign" the quality tank linings. Result: extra years of service, and lowest cost-per-year.

ACE rubber-protected tanks, pumps, valves, piping and special equipment are available for handling almost any acid or alkali. ACE Saran and polyethylene pipe and fittings also available. *Ask for catalogs.*

FLUID DRIVE

STANDARD MOTOR,
with current peak less than 40% of direct connected (special) motor drives.

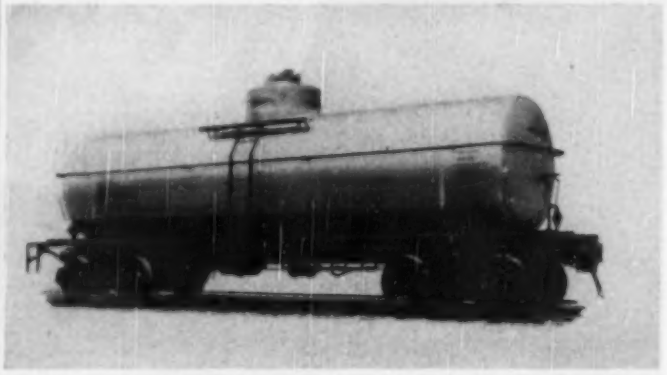
UNIFORM TORQUE,
adjustable application.

ACCURATE SPEED CONTROL,
with simple and convenient adjustment.

These features, and the inherent design of the Roberts Fluid Drive Centrifugal, (which permits special characteristics to be incorporated easily, thus suiting it exactly to your individual application) call for investigation. Don't reject the idea of applying centrifugal force until this investigation is made. Your inquiry will have our full and prompt attention.

ROBERTS
The
WESTERN STATES
MACHINE COMPANY
HAMILTON, OHIO, U. S. A.

Some linings can be applied in the field. A Lithcote lining is being applied to this car with portable equipment.



Aluminum cars are also finding a wider application in the chemical industry. However, their high cost is a limiting factor.

PACKAGING, cont. . .

be clad with nickel or stainless steel. Flour is being transported in a car specially designed to prevent contamination. This car, named "Trans-Flo," has filling openings in the top specially designed to prevent contamination. It is pneumatically unloaded from the bottom.

The improvements in insulation of tank cars has increased the number of liquids that can be kept at temperatures above their solidification point during transportation. Not only does this do away with the necessity of using steam coils but it prevents physical or chemical change which would otherwise occur if some compounds were allowed to solidify. Fiberglass and cork 4 to 10 in. thick are usually used for insulation. An outer metal jacket covers the insulation. Tank car manufacturers can readily calculate the rate of temperature change that may be expected for each kind and thickness of insulation used.

The use of aluminum, stainless steel, nickel, and linings of rubber and synthetic resins have provided a means for chemical manufacturers to lower their transportation costs. The increases in transportation rates in the last decade have made these tank car developments particularly welcome. In the present semi-war economy with a possible pending shortage of steel drums transportation by tank car will assume greater and greater importance.

These chemicals travel in aluminum

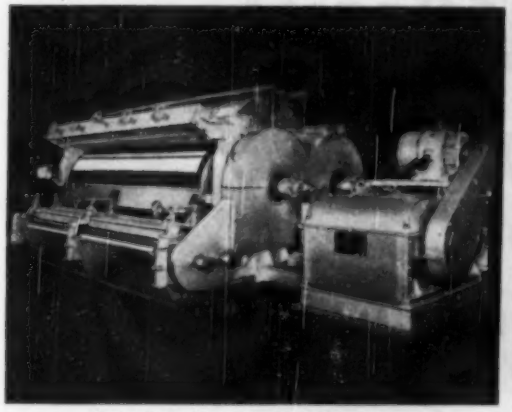
Metal Type	Chemicals Carried
38	Glacial acetic acid, formaldehyde, acetic anhydride, hydrogen peroxide, fatty acids, naphthenic acid, rosin (water white), nylon salt solution, oleic acid trichloroethylene
515W	Hydrogen peroxide, fatty acids, glacial acetic acid
28	Hydrogen peroxide
178T	Butylaldehyde
615T	Fatty acids, glycerin, nitric acid, nitrogen fertilizer solution
149	Acetic acid, butylaldehyde

—*End*

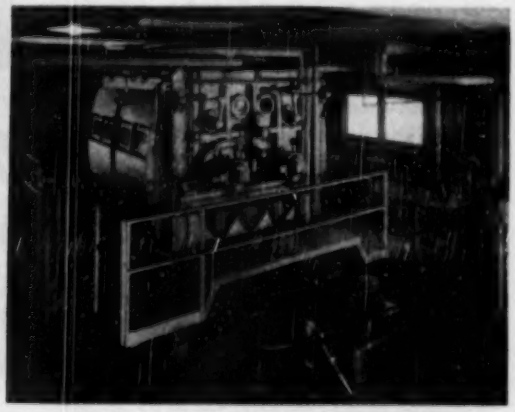
A Headline that is also a Helpline!

1	**BUFLOVAK DRUM DRYERS**	Liquid materials of limitless variety are successfully dried on the many type BUFLOVAK Atmospheric and Vacuum Drum Dryers.
2	**CONTINUOUS DRYING FOR LIQUID MATERIALS**	More and more products are being dried by this continuous, one-step process; chemicals . . . foods . . . pharmaceuticals. And, your product may be the new name tomorrow.
3	**LARGE CAPACITY . . . LOW COST**	Costs are lower and production greater, because drum drying is a one-step, continuous process, from liquid to dry product . . . quick as a wink.
4	**SAFE DRYING**	Quick, low-temperature drying . . . protection from contamination . . . freedom from dust or toxic hazards, are advantages only BUFLOVAK can offer.
5	**GIVE THE RESULTS YOU WANT**	You get the results you want because only BUFLOVAK builds all the different types and knows from experience what to recommend.

Catalog No. 348 has complete information. May we send you a copy?



Soap is dried on this special BUFLOVAK Atmospheric Double Drum Dryer equipped with cooling rolls.



BUFLOVAK Vacuum Double Drum Dryer, sanitary type, Stainless Steel, with chrome plated drums. Used for drying a food product.

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Dryers
- Vacuum Double Drum
- Vacuum Rotary
- Pilot Plant
- Atmospheric

Processing Kettles
- Mixers
- Impregnators
- Dopp Kettles
- Solvent Recovery & Distillation Equipment

BUFLOVAK RESEARCH AND TESTING LABORATORY

To assist you in the solution of processing problems, BUFLOVAK offers the facilities of its Research and Testing Laboratory—where small scale experimental units show you, before you buy, the commercial possibilities, data on production cost, and characteristics of the finished product.

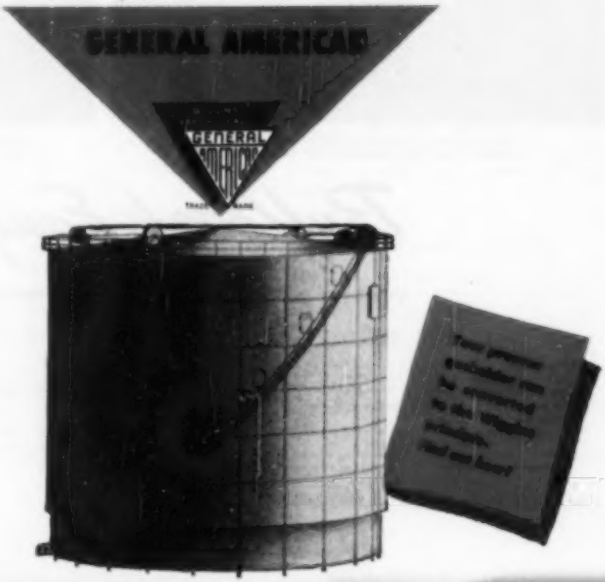
WEATHER WORRIES?

GET RID OF THEM WITH THE *Wiggins Gasholder* BY

Let the summer sizzle up to 110°. Let winter whip down to 50° below. No matter how extreme the temperatures, they can't bother the Wiggins Gasholder. Yes, it's basically different from all others, using an absolutely DRY, frictionless seal—proved gas-tight and impermeable by 15 years' use.

"Freeze-ups" are impossible—because there's no water to freeze, no tar, no grease to dehydrate. In the burning heat of summer, moisture can't adulterate stored gases—because there's no water to evaporate. Gases stay dry, pure, undiluted.

Impressive savings are obvious: Wiggins Gasholder design does away with need for steam coils, winter heating. No anti-freeze is required. Operating costs go down to zero—with no need for constant inspection and maintenance of seals. *Remote operation is now possible!* Absence of water or other sealant liquid permits construction with no heavy or complicated rigging. Even the foundation is lighter, for there is no heavy load of water to support. The Wiggins Gasholder is built to withstand heat, cold, ice, snow, wind, rain—and earthquakes! Operates at any pressure up to 20" of water. Write for complete technical facts.



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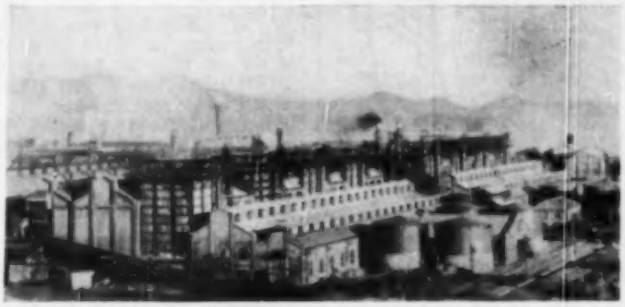
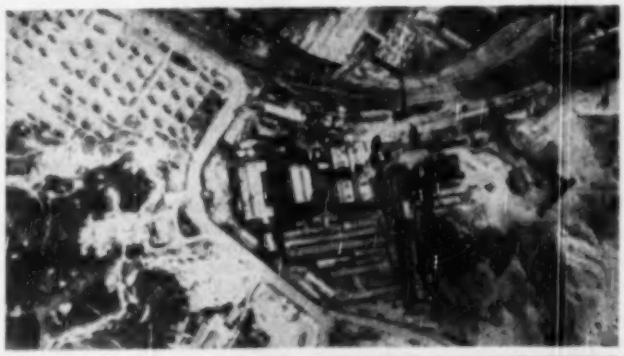
News From Abroad

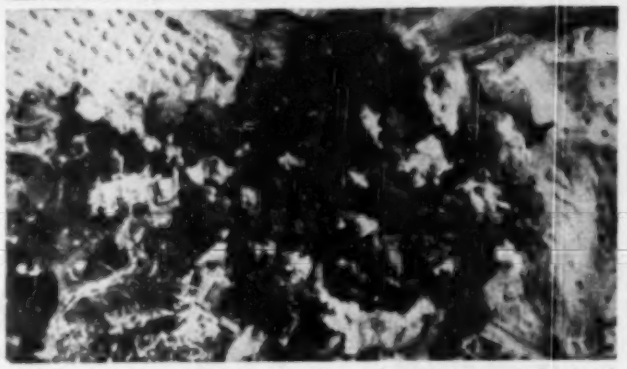
SPECIAL CORRESPONDENCE

A Korean Chemical Center Bows Out



Sulphuric acid capacity in plants like this at Konan, Korea, was 525,000 metric tons per year. Now it is zero as U. N. bombers wipe out Red war potential.





It suffered the same punishment that this Konan chemical plant received. A striking before and after shot illustrates the reason that business dropped off sharply.

Mexico Opens Big New Oil Refinery

Mexico City—The Mexican government has officially opened its $30 million Salamanca refinery which has been described by petroleum engineers as one of the finest and most modern installations in the western hemisphere.

The new plant is one of three being built by the government oil monopoly, PEMEX, to correct the unfavorable distribution system inherited from the foreign oil companies after expropriation in 1938. Then all oil lines ran to the Gulf seaboard with the intention of exporting the product. Refineries were also built usually near ports.

Mexico, faced with the problem of transporting the refined product back to supply its own growing needs (which nearly equal its production at present), decided what was needed were new refineries located more centrally. Two years ago the Dieciocho de Marzo refinery was opened outside of Mexico City. The Salamanca plant, second of the series, is located 200 mi. north of Mexico City and will supply gasoline and fuel oil to the growing industrial area in that vicinity as well as the many new diesel locomotives acquired by Mexico.

The new refinery is connected by a supplying pipeline with the rich Poza Rica oilfields 280 mi. to the east. The pipeline was built by PEMEX itself while the engineering supervision at the refinery was carried out by the Arthur G. McGee Co. of Cleveland. The latter firm also built the Dieciocho refinery which produces aviation gas.

The new refinery will handle 30,000 bbl. of petroleum daily. This will represent a 60 percent increase in the refinery capacity for the central plateau of Mexico as the Dieciocho installation was the only previous supplier.

Over 58 percent of the total oil consumption in Mexico is in the central plateau area. Even with the new refinery, the plateau region will not be able to supply its own needs and will have to be supplied additionally from seacoast refineries.

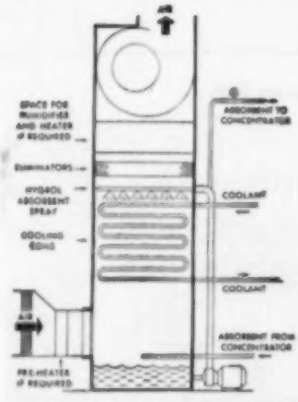
(*Continued*)

How You Save with the NEW Niagara Method of Air Conditioning

Using "Hygrol" Hygienic Absorbent Liquid

Because it absorbs moisture from the air directly, the new Niagara Controlled Humidity Method uses less, or no, mechanical refrigeration for dehumidifying. You save first costs and installing of heavy machinery. You save space, maintenance expense, power. You get easier, more convenient operation.

Using "Hygrol" hygienic absorbent liquid, this method gives complete control of temperature and relative humidity. Especially, it is a better way to obtain dry air for drying processes, packaging hygroscopic materials, preventing moisture damage to metals, and obtaining better quality for chemical process products and food products—or in obtaining better results in comfort air conditioning for office or laboratory at lower refrigeration costs.



NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

Food Packaging under Controlled Humidity

Niagara Controlled Humidity Air Conditioner

The diagram shows how filtered air is dehumidified by passing thru a spray of "Hygrol"—a liquid absorbent which removes air-borne moisture. This liquid is hygienic and non-corrosive; it contains no salts or solids to precipitate and cause maintenance troubles. It is continuously re-concentrated at the same rate at which it absorbs moisture, providing always the full capacity of the air conditioner, automatically.

Units provide a range of capacities from 1000 to 20,000 C. F. M. Multiple unit installations are in use successfully. Records of results are available. For further information, write Niagara Blower Co., Dept. CE, 405 Lexington Ave., New York 17, N. Y.

(*Advertisement*)

FOREIGN NEWS, cont . .

Brazil Worried About Lack of Alkali Imports

Rio de Janeiro—Brazilian chemical importers have appealed for official assistance in preventing any interruption in the supply of caustic soda and soda ash, stating that national reserves are dangerously low.

Despite import controls Brazil's purchases of these two chemicals are expected to exceed substantially last year's imports when 36,648 metric tons of soda ash and 55,810 metric tons of caustic soda were delivered from overseas. In the first five months of the year there had been imported 20,527 metric tons of soda ash and 27,591 metric tons of caustic.

Britain was the major supplier, shipping 15,356 metric tons of soda ash and 25,757 metric tons of caustic.

Gasoline Storage Facilities Expanded in Brazil

Rio de Janeiro—While a national program for gasoline storage expansion continues under study in Brazil American petroleum companies are steadily expanding their own facilities. A major share of the construction itself is being handled by the Brazilian subsidiary of Chicago Bridge & Iron Co.

Jobs on Chicago Bridge's books during the past few months total 555,860 bbl. spread over 29 tank units. The largest is the 40,000-bbl. vapor-dome unit being built for Standard Oil at Recife, on the Brazilian bulge. It is connected with two 2,500-bbl. cone-roof units.

Another big job is the five tanks with combined capacity of 2,121,500 bbl. being built to supply the Santos-Sao Paulo pipeline.

Bids soon are to be called for the biggest tank construction program undertaken in Brazil. The government refinery at Cubatao, near Santos will have 53 fixed-roof units with combined capacity of 3,973,000 bbl. and 28 floating-roof units with combined capacity of 28,995,000 bbl.

This job, naturally, will be broken down into different contracts but the construction firms engaged on it will

be working under a unique and possibly difficult situation.

Instead of each contractor doing his own fabricating at his own plant and then shipping to the site, the Brazilian government plans to establish a central pool of steel at site and have each contractor draw from it and fabricate right on location.

Socony's British Refinery For Middle East Oil

London—Completion of a $32 million oil deal between British and American companies has been announced. A site in the Thames Estuary has been acquired by the Vacuum Oil Co., a British subsidiary of Socony-Vacuum Co. In the next three years an 850,000-ton oil refinery for the production of lubricating oils will be built.

The deal was first arranged last March when the British-Duffryn Co. sold its oil storage and blending plant at Coryton, on the Thames, owned by its subsidiary, Cory Brothers, to the Vacuum Oil. Since then, plans for the new refinery have been agreed with the British government who through its Finance Corp. for Industry are providing some of the money required for construction.

The new refinery will mainly treat crude oil from the Middle East and the lubricating oils produced will help replace imports from dollar sources.

Last year Britain spent $14,760,000 on lubrication oils from the United States.

Paper Plant Will Use Cane Fibers in Brazil

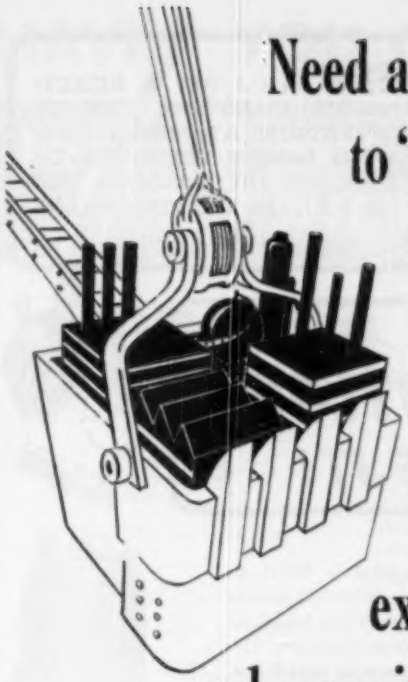
Sao Paulo — Delivery of a 5,000-metric ton a year paper and cellulose factory costing $2 million has been contracted for by Cia. Refinadora Paulista S.A. of this city from Celdecor South Africa Ltd. of Great Britain.

The plant is to be set up near the town of Piracicaba in Sao Paulo state, and will use crushed sugar cane fiber as its raw material. Present plans call for the factory to be installed by mid-1952.

Reds Use Slave Labor In Uranium Ore Deposit

Istanbul—A large ore treatment plant has been established near the uranium mines at Buhovo, Bulgaria, according to reliable reports reaching Turkey. Mining operations at Buhovo, a small village some 18 mi. from

(Continued)



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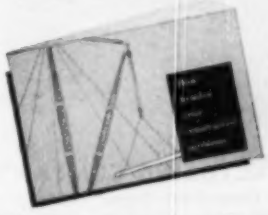

New M-C & S booklet illustrates how challenging construction problems are solved in minimum time, with maximum economy. Your copy will be sent immediately upon request to Dept. CENS.

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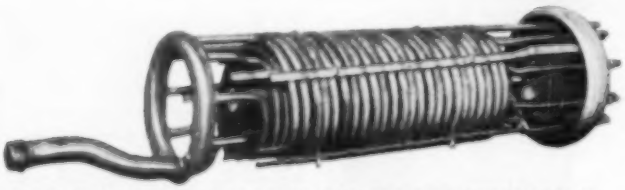
MAKE SURE . . .

LET WHITLOCK MAKE IT!

Here's a problem that's typical at Whitlock. This unit cools gasoline to —69° F. . . . permits aeronautical engineers to study the behaviour of gasoline at high altitude temperatures. The design of the cooler provides even distribution of the Freon 22 refrigerant; the cooling coil being fed from a multiport valve through 9 inlet terminals. The specifications all added up to this storage-type cooler, 18" diam. by 79" long. It was fabricated of Type 347 stainless steel, A.S.M.E. Spec. SA-240 Grade C, and constructed in accordance with Paragraphs U-68, U-140 and Case No. 897 of the A.S.M.E. Code. The assembly was stress relieved and X-rayed as required by these paragraphs.

Whether your heat transfer requirements are standard or "special", ask Whitlock engineers to make recommendations.



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Sofia, have been carried on on a large scale ever since the nationalization of all Bulgarian mines.

The plant is designed only for "partial treatment"—to cut down the ore's volume, thus increasing the capacity of transport facilities. Ultimate destination of the ore is unknown.

The Buhovo mines were privately owned prior to World War II. The Germans exploited them only on a limited scale. Major activity did not begin until mine nationalization. No data is available on the output. The miners are reportedly young recruits from the "compulsory work service" organization.

The Buhovo area, long a mecca for tourists visiting the old monastery there, is said to be under strict police surveillance. General travel is permitted to the area, but there is a reluctance on the part of Bulgarians to visit the section.

The Buhovo mine is believed to be the only big uranium producer in the Balkans, and one of the few in Europe. However, it is generally conceded that other uranium deposits have been found in Bulgaria.

Brazil Pushes Search For National Resources

Rio de Janeiro—A step-up in surveys of oil-bearing shale deposits in the Rio Paraiba valley between Rio de Janeiro and Sao Paulo has been requested on the National Petroleum Council by the National Security Council.

The Security Council decided that all steps should be taken to develop distillation of petroleum if the deposits prove worthwhile, and set 10,000 bbl. daily as the goal.

Excellent possibilities of oil deposits along the coast near Campos, state of Rio de Janeiro, have been reported to the NPC by American geologists Horace Williams and Harold Hickman. Characteristics of the strip resemble those at Tampico, Mexico, and a 40-meter test well has indicated oil-bearing soil.

Exploration teams reporting to the Mineral Production Department of the Ministry of Agriculture recently located signs of both tin and iron ore deposits in the Territory of Amapa, northern Brazil.

Polish fertilizer for Australia—Sydney—The Commonwealth Government is understood to have placed a $1,410,000 order with Poland for supplies for fertilizer sulphate of ammonia. The purchase was ne-

gotiated with Soviet officials in Canberra; a shipment has already left for Australia.

Two aluminum plants—Ottawa—The Aluminum Co. of Canada is proceeding with the construction of a $500 million project in northern British Columbia. An aluminum plant will be built at Kitimat on the Pacific Coast about 350 mi. north of Vancouver. The company also plans to start expansion of its plant at Ile Maligne, Que., with the project expected to cost between $6 and $7 million.

German benzene—Essen—The Allied Security Board has authorized the Gelsenkirchen Scholvener Chemie Co.'s hydrogenation plant to produce 10,000 tons of crude benzene a month from coal by a new process yielding 10 percent more benzene than previous methods. Extensive reconstruction was required but production is expected to start in about two months at a rate of 5,000 tons a month. The company has also asked permission to process crude oil and residues.

Insecticides for Brazil—Rio de Janeiro—Decreasing domestic stocks of insecticides coupled with heavy plantings of cotton have brought official decision to import 14,000 metric tons of foreign insecticides. The step had the approval of the domestic industry which earlier had claimed that its production was enough to meet national requirements.

Sulphate pulp mill—Ottawa—A Canadian sulphate pulp mill, costing $19 million, has been opened 6 mi. south of Nanaimo in British Columbia. At present, the mill is producing only unbleached pulp at 250 tons a day. A pulp bleaching unit will be completed on the site within a few months.

Hong Kong chemicals market—Hong Kong—A boom has set in on the Hong Kong chemical market since the outbreak of war in Korea and prices are rising; moreover the upward trend is expected to continue. The reasons put forward for the situation by the Hong Kong publication, the *Far Eastern Economic Review*, include: low stocks in China with most Chinese ports cut off from outside contacts; U. S. export controls on certain products; hoarding and profiteering since the outbreak of the Korean war; and demands from India and Thailand.

(*Continued*)

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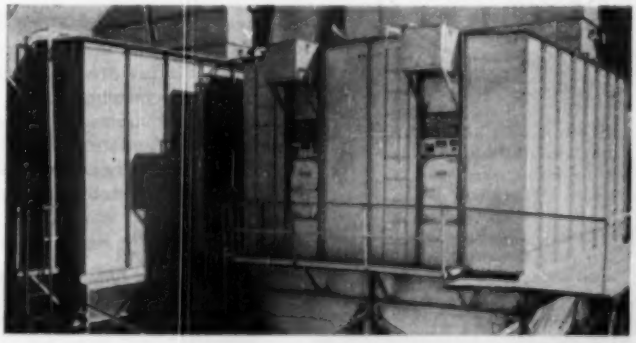

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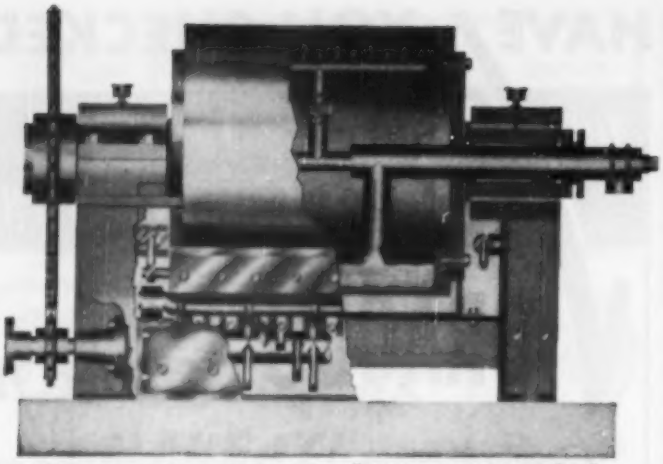
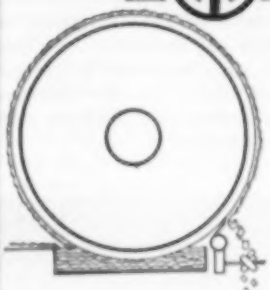


Convert your molten materials to the finished product in *ONE OPERATION* with a

GB Flaker



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The flaker shown above is one of the several types produced in our modern plant. G-B Flakers are manufactured to standard specifications, or to meet your specific requirements. They are available in all materials of construction, and can be provided with vapor-tight hood if required. Write for complete details.

● Phone, wire or write for our Bulletin No. 801-C giving more complete information on Goslin-Birmingham Flakers. Engineering service and counsel are available on request. No obligation or cost.

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FOREIGN NEWS, cont. . .

The publication says that stock position in China is considered low and therefore demand from Chinese factories and dealers is bound to continue buoyant; there has also been stronger demand for industrial raw materials, especially chemicals, since the end of the civil war.

Egyptian refinery—Cairo—The Egyptian government has earmarked a sum of $2,500,000 for purchasing equipment for the establishment of a new petroleum refinery at Suez. Realization of this project would bring about an increase of 1 million tons a year in the present local production of refined gasoline. Present production at the government's Suez refinery amounts to 350,000 tons a year, while the new plant will have a capacity of 1,350,000 tons.

Dutch-Czech trade—The Hague—Under a new trade agreement concluded between Holland and Czechoslovakia, covering the period August 1, 1950 to August 1, 1951, Holland will export 18 million florins' worth of chemical products and will import chemical products to a total value of 3.5 million florins. Total value of Czechoslovakian products imported into Holland will be 90 million florins. Dutch exports to Czechoslovakia will be of the same total value.

Germany imports nitrate—Frankfort—A new provision under the Chilean-West German Payments Agreement of May 11, 1949, allows Germany's imports of nitrate to be balanced in a clearing account. They formerly had to be paid for in U. S. dollars in New York.

Alumina in Jamaica—Ottawa—Aluminum Ltd. is ordering equipment for the first alumina (aluminum oxide) plant in the British West Indies. It will be built in Jamaica at an initial cost of $8 million.

Canadian cellulose plant—Ottawa—The new $27 million high alpha cellulose plant of Columbia Cellulose Co., near Prince Rupert, B. C., is now expected to commence production in the first quarter of 1951. Columbia Cellulose Co.'s plans call for initial production in excess of 200 tons a day. This is equivalent to about 44 percent of the 1949 consumption of high alpha pulp by the acetate, cuprammonium and viscose high tenacity tire cord industries combined. —*End*

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The Corrosion Forum

MORGAN M. HOOVER, *Assistant Editor*

Construction Materials in the Paper Industry
Part II—Bleaching

Part II of a symposium in which materials of construction are evaluated for various services in the paper industry. Part I appeared in the September issue and dealt with stock handling. Parts III and IV will deal with acid pulping and alkaline pulping, respectively. Since the bleaching articles exceed space requirements for this issue, Part II will be continued in the November issue.

High-Silicon Irons

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

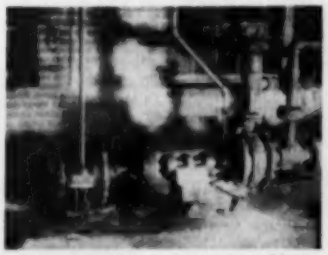
High-silicon iron alloys show excellent resistance to chlorine and chlorine compounds and are, therefore, widely used in the pulp and paper industry for handling bleach solutions. Chlorine compounds, including sodium and calcium hypochlorite, moist chlorine gas and hypochlorous acid, are normally very corrosive; the high-silicon iron alloys are among the few materials of construction having the high degree of corrosion resistance necessary for successful handling of these compounds.

Duriron is a high-silicon iron alloy with a nominal chemical composition of 14.5 percent Si, 0.75 Mn, and 0.90 carbon. Durichlor contains an additional 3 percent Mo; this gives increased resistance to hydrochloric acid and many chlorine compounds. Both alloys are supplied in the cast form only. Because of their extreme hardness, any machining must be done by grinding methods. Nevertheless, these alloys are available in many forms of chemical equipment such as pumps, valves, ejectors, pipe, tank outlets, jets, fans and spray nozzles, which makes them applicable to bleach make-up and handling.

Since Durichlor is the better alloy for handling chlorine and most chlorine compounds, it is usually the preferred analysis for bleach handling. This is especially necessary for the conditions where chlorine gas is encountered in the presence of moisture; Durichlor is generally recommended for use at the point of chlorine introduction into the system. For instance, Durichlor is used in numerous installations where bleach make-up is done by merely introducing chlorine at the bottom of the tank and allowing it to be absorbed as it is bubbled through the milk of lime or sodium hydroxide.

Durichlor is even more widely used where the bleach make-up liquor is recirculated by a high-silicon iron pump and the chlorine is continuously introduced by a Durichlor ejector. This procedure results in more adequate mixing of the chlorine and thus provides more complete absorption. This recirculating pump can also be used to transfer the bleach to the point of use. Supersaturated chlorine water solutions are also produced by this method. These solutions have been reported as ranging in concentration from 57.5lb. of chlorine per 1,000 gal. of water to as high as 100 gpl. of chlorine. Under these varied conditions, the service life of Durichlor ejectors ranges from 6 months to 2½ years. Corrosion is especially severe in the ejector because of the combination of chemical attack and high velocity. This severe combination usually results in early failure of alloys not exhibiting the required high corrosion resistance. One paper company is also using Durichlor inlet pipe for introducing chlorine directly into the bleacher. This installation is still providing successful service after five years' continuous operation.

Although Durichlor shows good resistance to nearly all chlorine conditions, there are many services for which Duriron has adequate resistance. It, too, is extensively used in bleach handling and provides ideal service for bleach transfer lines because of its immunity to corrosion. Transfer pumps and valves are also commonly used in such installations. In contrast to cast iron or steel pipe in calcium hypochlorite service, there is no scale build-up in Duriron pipe to cause clogging of the lines and perhaps contaminate the finished paper. In sodium hypochlorite handling Duriron lines, valves and pumps provide a service life in terms of years in comparison to a few months at the most with cast iron or steel.



Duriron pump in calcium hypochlorite bleach makeup and transfer system.

High-silicon iron pumps are not normally used for handling chlorinated chemical wood pulp stock because they are not designed to handle the required high capacity or the high percentage of suspended matter. However, on several occasions Duriron has been successfully applied as a pump material where the stock consistency did not exceed 3½ percent. No corrosion was evident after many years' continuous handling of this corrosive material.

In addition to the standard bleach solutions, experience indicates that the high-silicon iron alloys should be considered for handling other bleach solutions such as chlorine dioxide and sodium chlorite. Test information compiled to date indicates that these alloys show very little corrosion under service conditions.

Cements

RAYMOND B. SEYMOUR, *The Atlas Mineral Products Co., Mertztown, Pa.*

Corrosion resistant cements are less resistant to bleaching processes than to any other phase of the pulp and paper industry. Portland cement has been considered acceptable in some alkaline bleach processes even though it is fairly rapidly attacked. Obviously, Portland cement is unsatisfactory for acid bleach. Silicate cements cannot be used for alkaline bleach solutions but give fair results on the acid side.

(*Continued*)

Litharge-glycerol and sulphur cements are usually considered unsatisfactory. Phenolic or furfuryl alcohol cements are generally selected as the most effective materials.

Furfuryl alcohol cements are preferred for alkaline solutions and phenolic cements for acid bleach but both require occasional repainting. An alkaline resistant phenolic resin appears to be the most satisfactory cement for chlorine oxide bleaching. A recently developed hot melt cement based on a hydrocarbon synthetic resin has shown promise in several installations but not enough performance data are available to date to warrant any definite recommendations.

Data in the following table show the percent loss in weight with time for various cements immersed in 5 percent sodium hypochlorite at room temperature.

Corrosion of Resin Cements Immersed in 5% Sodium Hypochlorite at Room Temp.

Cement	Percent Loss in Weight 10 days	20 days	30 days
Carbon-filled polyfurfuryl alcohol	2.7	4.3	7.5
Quartz-filled phenolic	8.1	—	10.9
Carbon-filled phenolic	1.9	1.6	1.6

Nickel, Nickel Alloys

H. O. TEEPLE, *International Nickel Co., New York, N. Y.*

The bleaching of paper stocks has assumed considerable importance during the last several years. Consequently, serious corrosion problems have confronted the industry in this phase of paper making.

Various bleaching agents have been used, such as chlorine, chlorine dioxide, sodium chlorite, sodium or calcium hypochlorite, sodium peroxide, zinc hydrosulphite and possibly others.

Of these various bleaches the ones containing active chlorine are responsible for the more aggressive corrosion problems. This is due primarily to the fact that the number of materials of construction useful for handling wet chlorine or strong hypochlorite solutions is quite limited.

When chlorine is used as the active bleaching agent, a multi-stage system is used to obtain a controllable degree of stock brightness. The number of stages can be from one to as many as eight. The number of stages required is based upon the extent of bleaching desired for a given stock. A four-stage system consists of a low consistency direct chlorination, a caustic extraction, a high density hypochlorite treatment, another caustic extraction followed by a second hypochlorite bleach and subsequent washing.

Generally tile lined chests are used to resist corrosive attack by the bleaches as well as to minimize color contamination of the stock. In direct chlorination rubber-covered agitators have been used rather successfully. As far as metallic materials are concerned, a nickel-base alloy containing high percentages of chromium and molybdenum is practically the only alloy commercially available having adequate resistance to corrosion by wet chlorine. Monel and nickel, Inconel and Ni-Resist are not generally suitable for this severe service.

However, Monel is suitable for use as covers on the caustic extraction washers and on the hypochlorite thickeners, service life performance indicating one to three years performance.

A plant corrosion test in filtrate from a washer handling hypochlorite bleached soda pulp illustrates the suitability of Monel. Results are shown in Table I.

Table I—Corrosion by Filtrate from Washer Handling Hypochlorite-Bleached Soda Pulp

Chlorine content 0.009 gpl., pH 6.9, temp. 72 deg. C., duration of test 72 days, filtrate flow 1,050 gpm.

Material	In. per Yr.
Monel	0.0001
Nickel	0.0001
Inconel	0.0001
Ni-Resist	0.002

Monel is not suitable for handling chlorine bleached stock and this point is illustrated by the data in Table II.

Table II—Corrosion by Chlorine-Bleached Stock

Paper stock containing 0.15 gpl. HCl and 0.02 gpl. free chlorine. Duration of test 90 days.

Material	In. per Yr.
Monel	0.043
Ni-Mo-Cr alloy	<0.0001
Ni-Resist	0.022
Type 316 stainless	0.0001

As these data indicate, the molybdenum bearing austenitic stainless steel is suitable for this application; plant service experience has verified this point.

It should be noted in passing that rubber-covered steel parts for washers and thickeners have received widespread acceptance as a means of prolonging service life of such equipment.

The use of sodium peroxide as a bleaching agent has generally been confined to the bleaching of groundwood. The use of this alkaline bleaching agent does not result in many severe corrosion problems. Monel, nickel, Inconel and Ni-Resist are all suitably resistant to corrosion by these bleach solutions. The use of these materials provides adequate service life and in addition preserves the quality of bleached pulp by preventing color contamination. Carbon steel and cast iron would be expected to show reasonably low rates of corrosion but experience has indicated their use is not conducive to the maintenance of a bright stock.

Zinc hydrosulphite is also used for the bleaching of groundwood pulp. This bleaching agent is relatively new but corrosion tests have indicated that the use of Monel is suitable for handling the bleached stock. Tables III and IV show this to be true.

Table III—Corrosion in a Stock Chest Handling Zinc Hydrosulphite Bleached Stock

Temp. 74 deg. F., pH 4.5, duration of test 209 days.

Material	In. per Yr.
Monel	0.002
Nickel	0.003
Inconel	0.0001
Ni-Resist	0.003

Table IV—Corrosion in Inlet to Bleached Stock Washer

Temp. 130 deg. F., pH 4.0, duration of test 209 days.

Material	In. per Yr.
Monel	0.001
Nickel	0.004
Inconel	0.0001
Ni-Resist	0.003

In conclusion, corrosion problems arising in the bleach house tend to be serious. But judicious use of available materials of construction generally will mitigate the severity of the problems so that an economic operation will result.

Stock Handling

The following two articles are part of the stock handling group that we featured in last month's Corrosion Forum.

Rubber

JAMES P. MCNAMEE, *U. S. Rubber Co., Providence, R. I.*

Rubber linings are used extensively in paper mills because natural rubber and the various types of synthetic rubber are chemically resistant to acids, alkalis and salt solutions. Moreover, rubber can be adhered to rigid and irregular surfaces to form a protective covering which will resist abrasion and wear in addition to chemical attack.

(Continued)

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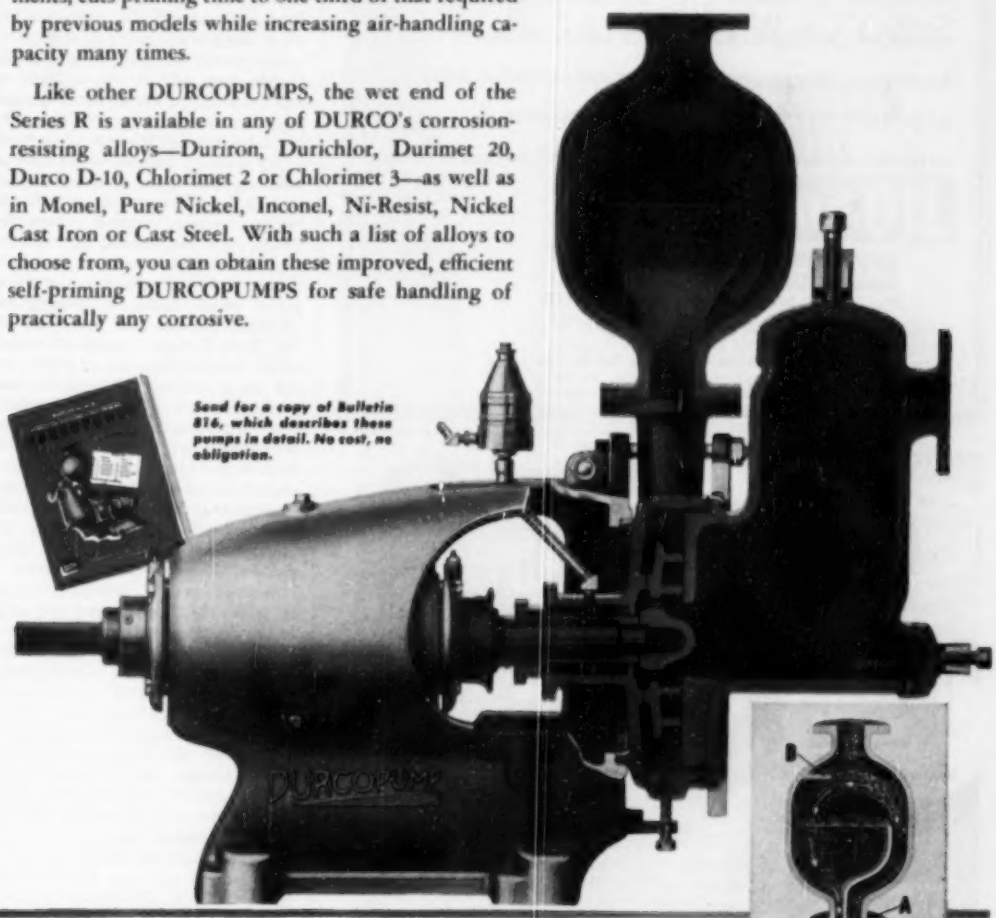

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This drawing shows how the Series R DURCOPUMP operates in priming. When the pump is started, the water is thrown upward into the air separator through port A, while air is drawn in from the suction line at the eye of the impeller. Water and air pass into the air separator. The water, baffled by plate B, returns through port C. The air passes into the discharge line. When the air in the suction line is evacuated, the impeller discharges liquor through both ports A and C.

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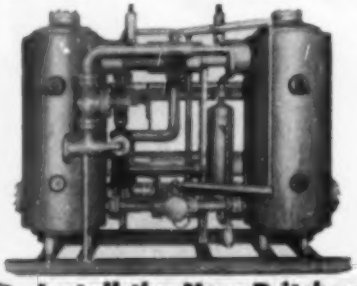

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CORROSION FORUM, cont. . .

In the handling of paper stock, rubber linings should be considered for tanks, pipe, fittings, fans, duct-work, agitators and pumps. This is particularly important for chorinated paper stock in order to prevent contaminating the stock and injuring the color of the paper. All internal parts of pumps which are exposed to the stock should be rubber covered. A semi-hard or hard natural rubber composition is generally used for these applications, although soft rubber is more abrasion resistant and is recommended when abrasive solids are present.

The rubber lining manufacturer has a wide range of synthetic rubbers as well as natural rubber to use in designing lining compositions. Natural rubber is regarded as the general purpose lining material because of its ease of handling and wide application, but each of the different types of synthetic rubber possess certain properties which may be utilized for specific applications. As examples we might mention the oil resistance of Neoprene which makes it suitable for handling gasoline and machine oil. The Buna N types of synthetic rubber which include Paracril and Hycar, are still more resistant and may be used in contact with animal and vegetable oils. Butyl rubber is not affected by strong oxidizing agents and may be used as protection against strong concentrations of nitric, chromic and sulphuric acids and strong dichromate solutions. All rubber linings are "tailor-made" from these basic materials for the particular application.

If paper stock is allowed to remain in rubber lined equipment as a result of intermittent production or between short runs, it will not become discolored and introduce contamination into the system when production is resumed. Slime formation is retarded to a considerable extent and in some cases eliminated completely by rubber linings. Many installations of hard rubber lined pipe have more than justified their original cost on the basis of slime control alone.

Rubber linings should be considered for storage tanks for the many corrosive chemicals used in connection with the handling and treatment of paper stock, as, for example, alum solutions. Pipe and pumping equipment used with these solutions should also be protected with rubber linings.

The new solid plastic pipe fabricated from materials of the Uscolite and Saran types is a particularly important development and should be seriously considered for paper mill application. This pipe is resistant to most acids, alkalis and salt solutions.

It is not affected by chlorine solutions or chlorinated paper stock and its smooth surface should minimize slime formation. An additional advantage is the fact that since the pipe is solid plastic, the outside surface requires no protection against corrosion or slime growth and should go far towards maintaining a clean appearing mill.

Coatings

KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

Current use of organic coatings and coverings in the production and handling of paper pulp is principally for three purposes: to impart cleanliness to all operations, to prevent deterioration of equipment by corrosive agents, and to provide resilient cushioning where required.

Cleanliness of all operations from the blow tanks on is imperative as fine dust or dirt contamination of the pulp will be carried through into the finished paper product. Bacterial slime which will normally build up in white-water handling lines and other equipment will not only reduce the capacity of these lines and equipment, but detached pieces of such slime will be carried with the pulp slurry onto the paper-making machine resulting in a weakness and lowered quality.

After washing of the cooking liquors from the pulp, and with the exception of bleaching operations which are separately discussed, corrosion of equipment is principally due to pitting caused by the use of dissimilar metals, by local cell action caused by oxygen or concentrations cells, and by normal iron rust formation. In addition to the gradual deterioration of equipment, such corrosion will produce pits or irregularities in surfaces which must, for quality production, remain of uniform smoothness. Table and couch rolls and weir gates are examples.

Resilient cushion is required of squeeze and take-off rolls for pulp washers and is of advantage in many applications on the wet end of the paper machine, and is desirable wherever resistance to impact or abrasion is required.

All stock-handling operations between the blow tanks and the drying cylinders of the paper machine are conducted at temperatures below 160 deg. F., and therefore choice of coatings or coverings is determined by chemical and physical properties other than thermal limitations.

For use in pulp and paper production the organic protectors may be divided into three classes, according to thickness: thin films, of the order of thickness of usual paint films, 3 to 10

(Continued)

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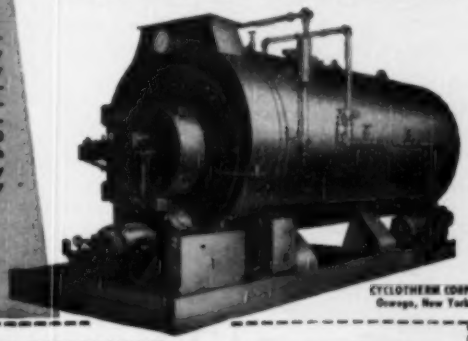

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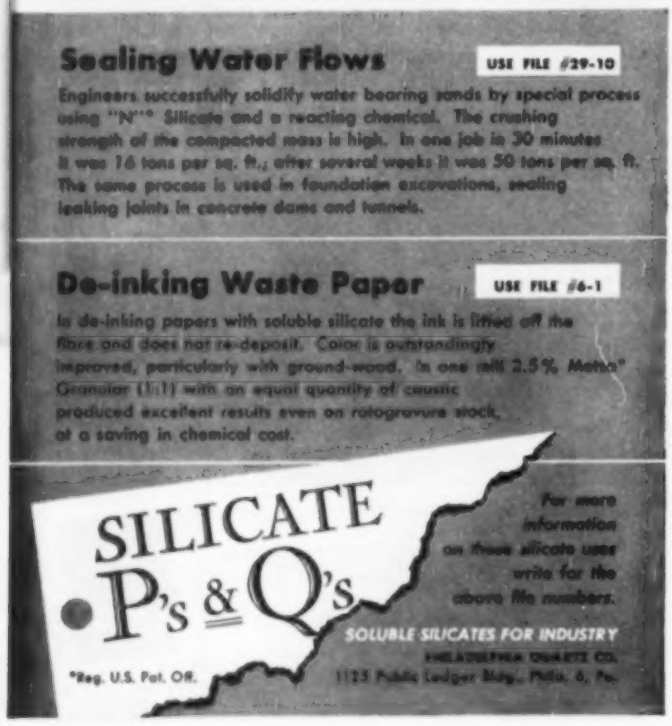
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mils; heavy linings and coverings, such as the usual rubber linings, ¼ to ½ in.; and coatings. Also coverings of intermediate thicknesses, from 20 mils to ⅛ in., which can be readily obtained by such materials as certain of the liquid applied bitumin-base materials and certain neoprenes.

For all uses where cleanliness is the objective, where abrasion and impact is of little consequence, and where direct contact with strong corrosives is not encountered, the thin film coatings of vinyls, chlorinated rubber, brushing or spraying neoprenes, and bitumins have been successfully used. Such uses include the coating of the exteriors of all production equipment, pipelines, and the paper-machine, as well as maintenance protection of walls, ceilings, and structurals of the production buildings and areas. These materials all have excellent resistance to the corrosive and humid atmospheres encountered in any stage of pulp or paper-making, and are readily applied to clean, dry surface by spray or brush. All dry at normal atmospheric temperatures. It is usually difficult to maintain dry surfaces for coating application under the humid conditions prevailing in this industry, and it is noticeable that those coating compositions having the greatest latitude in regard to surface preparation, namely chlorinated rubber and the bitumins, give generally better performance.

The baked phenolic coatings have especially earned themselves an accepted place in this industry. The smooth, glasslike finish of these hard, tough bacteriophobic coatings have lead to their long sucessful use in combating slime formation in pulp slurry and white water lines and equipment. They are resistant to all of the corrosive environments, except those encountered in the digester room and cooking liquor cycles of alkaline pulping processes. These coatings require baking at temperatures of 350 deg F. to complete their application. Therefore field applications are seldom made except for the protection of large or heavy fixed equipment.

Specific listing of equipment on which these thin film coatings have been successfully used resembles a bill of equipment for a pulp mill excepting the digester house, and includes pulp washers and washer drums, pulp measuring devices, rectifier and distributor rolls, beaters, stock chests, stock pumps, flow boxes and baffles, suction box covers, and white water systems.

The heavy linings forming resilient cushions and corrosion barriers, ex-

emplified by rubber applications in thicknesses from ¼ to ½ in. thick, find application wherever severe abrasion or impact or strong corrosives are encountered. They also find many applications where their resiliency is important such as for squeeze rolls. The bleach room applications of these linings are many. Their dependable performance against strong corrosives is further demonstrated in their use as linings for alum mixing tanks. Some of the other successful applications of these linings are for all lines and equipment which the acidic pulp from sulphite digestion contacts from the blow tanks up to and including the pulp washers and filters, and the waste sulphite liquor handling system.

The third type of organic protectives, namely those most practically applied in thicknesses of 20 mils to ⅛ in., have not been sufficiently emphasized by their use in this industry, although their suitability has been thoroughly proven in pulp production. They will here be designated as heavy-duty coatings to distinguish them from the thinner protective coatings and the heavier linings and coverings. At the present time these are notably represented by certain bitumin and neoprene compositions. Their utility, like their applied cost, falls between that of the thin coatings and the heavy rubber linings, serving satisfactorily in services too severe for the former and which do not justify the higher cost of the latter. They may be reliably applied by better mill maintenance departments and are also available as applied linings by many lining companies.

The bitumin-base materials, applied by brush, spray or hot melt depending upon composition, are used for maintenance coating of equipment exteriors and heavy-duty maintenance painting. The neoprene-base materials, possessing also the resilience and chemical resistance typical of this vulcanized rubber, finds many further applications where an appreciable degree of abrasion and chemical corrosion resistance is required. This lining has been successfully used in all applications previously mentioned for the thinner coatings and in addition has given excellent service as alum mixing tank linings.

NOTE: *While this article is primarily based on the author's experience, acknowledgement is made to O. R. Huggenberger, Dominion Rubber Co. Ltd.; R. H. Biddle, West Virginia Pulp and Paper Co.; M. G. Lyon, Champion Paper and Fibre Co.; and P. B. Davidson, Strathmore Paper Co. for contributing observations based on their own operations.* —End

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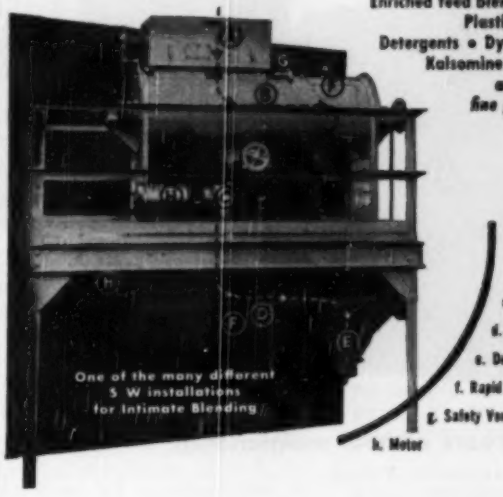

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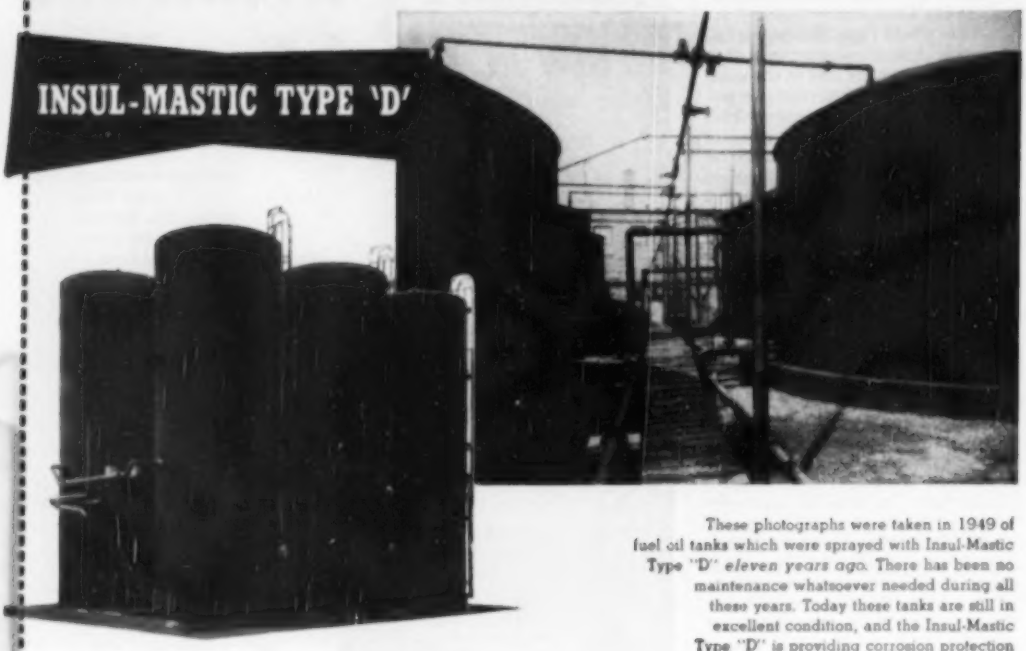
134

The coating that both insulates and prevents corrosion



These photographs were taken in 1949 of fuel oil tanks which were sprayed with Insul-Mastic Type "D" *eleven years ago*. There has been no maintenance whatsoever needed during all these years. Today these tanks are still in excellent condition, and the Insul-Mastic Type "D" is providing corrosion protection and unimpaired insulating value.

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INSUL-MASTIC TYPE "D" is the dual purpose coating that not only insulates but also prevents corrosion. It is quickly applied to tanks, ducts, pipes and other metal vessels by spray gun and adheres at any angle without mechanical support.

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Names in the News

MAN OF THE MONTH

J. C. Warner

Carnegie Institute of Technology inaugurates this month its fourth president. The man of the hour will be John C. Warner, for the past five years dean of graduate studies in the college of engineering and science.

Asked about his origins, the short, powerfully built Warner removes his plain, medium stemmed pipe and replies that he grew up on a farm near Goshen, Ind.—"You know, Land o' Goshen." He was born there on May 28, 1897, the second of four sons.

A thorough Hoosier, he earned his A.B., M.A. and Ph.D. degrees all from the University of Indiana. While he was about it, he made a couple of other lifetime acquisitions: the nickname, Jake, and a wife. Mrs. Warner, then Louise Hamer, was a student in a qualitative analysis class he was presiding over as a graduate instructor. She was a member of Delta Gamma sorority and it has been said that "Jake Warner could pass anything at Indiana University except the Delta Gamma house." Other extracurricular activities included playing halfback in football, violin in the college orchestra, winning a letter in wrestling. He became president of his fraternity, Delta Upsilon. He also made Phi Beta Kappa and Sigma Xi.

His first contact with industry came in 1923 as a research chemist for the Barret Co. He then was associated with Coden Oil Co. and Wayne Chemicals Co. before joining Carnegie Tech's faculty in 1926. There he moved from assistant professor of chemistry to associate professor of theoretical chemistry in 1933, to associate professor of metallurgy in 1936 to head of the department of chemistry in 1938.

Dr. Warner was granted leave of absence in December 1943 to participate in the development of the atomic bomb. He became assistant to Dr. Charles A. Thomas, vice president of Monsanto Chemical Co., who was directing studies looking to the chemistry, purification and metallurgy of plutonium. It was Dr. Warner's task to direct and coordinate research in the laboratories of the University of California, the University of Chicago, Iowa State College, Massachusetts Institute of Technology, and at Los Alamos, N. M. He later assisted Dr. Thomas in the operation of the Clinton Laboratories at Oak Ridge, Tenn.

In 1945 he returned to the Carnegie campus. As dean of graduate studies in the college of engineering and science, Dr. Warner has had the responsibilities of administering and leading the expanded program recommended by the institute's postwar planning committee.

He was the 1945 winner of the award of the Pittsburgh section of the ACS and was later elected a director-at-large of that society.

Today the Warners live in a comfortable, white house in Pittsburgh, and have two sons, Bill, 19, and Tom, 17. The family outdoor charcoal grill gets a lot of use during spare hours, and summer months often finds the four of them off to a lake for swimming and fishing. Dr. Warner's real love is golf but wartime work pushed the golf clubs into the closet and he still hasn't been able to find the time to get them out.

E. W. Thiele and **E. W. Adams** have been made associate directors of research of the Standard Oil Co. (Indiana). Both joined Standard's research staff in 1925 and were formerly assistant directors of research. **A. L. Conn** has been appointed division director in charge of pilot plants; **Nathan Fragan**, in charge of all research activities in the field of chemical products; **C. M. Loane**, in charge of research on lubricants.

E. W. Volkmann and **F. L. Jones** have been appointed assistant managers of the research department, Koppers Co., Pittsburgh, Pa. Mr. Volkmann received his degrees in chemical engineering at Columbia University. In 1934 he joined Koppers as assistant technical director of its tar and chemical division and he has been associated with the research department since 1940. Mr. Jones, prior to joining the company in 1948 as business manager of the research department, was director of chemical research for the Bausch & Lomb Optical Co.

Charles E. Lapple and **Aldrich Syverson** have been appointed associate professors in the department of chemical engineering at Ohio State University. Mr. Lapple has been associated with the engineering research laboratory of E. I. du Pont de Nemours Co., Wilmington, where he specialized in dust collection, atmospheric pollution abatement, aerosols, size classification and fluid mechanics. Mr. Syverson has been associate professor of chemical engineering at Syracuse University since 1948.

E. E. McSweeney has assumed new responsibilities at Battelle Memorial Institute representative to the chemical industry. He will direct relations between Battelle and sponsors in the industry. A member of the Battelle staff since 1938, he has recently directed plastics, rubber and coatings research.

James B. Weaver has been appointed techno-economist in the commercial evaluation department of Olin Industries, Inc., East Alton, Ill. Formerly, he was with Godfrey L. Cabot, Inc., as pilot plant supervisor and assistant to the director of research.

Robert H. Steiner has been named research coordinator for Atlas Mineral Products Co., Mertztown, Pa. He has been with Firestone Tire and Rubber Co. for the past seven years.

N. H. Jacobson, formerly industrial press supervisor for Allis-Chalmers Mfg. Co., has been appointed business press liaison officer for the Atomic Energy Commission.

J. D. May has been named manager of the control section of the tar products division of Koppers Co., Pittsburgh, Pa. He was formerly assistant manager.

Carl S. Miner, director and founder of the Miner Laboratories, Chicago, has been awarded the **Honor**

(*Continued*)

Scroll of the American Institute of Chemists in 1950. He is particularly known for his work in developing chemical processes for the utilization of agricultural materials.

Gordon Kiddoo has been appointed director of research and development for Continental Carbon Co., Amarillo, Tex. He previously was with the Texas Co. in chemical engineering processing work, and in the design, construction and operation of pilot plants for the synthesis of fuels. He is a chemical engineering graduate of Cornell University.

G. M. Halsey

G. M. Halsey has been appointed to the newly-created post of director of manufacturing for the entire chemical and pigment division of the Glidden Co. in Baltimore. **James W. Pollard, Jr.**, formerly plant engineer, has succeeded Mr. Halsey as manager of the Baltimore plant. **A. J. Benjamin** has been advanced to the position of assistant manager and **Irving J. Foote** has been named plant engineer.

Philip A. Singleton has been appointed assistant to the chairman and managing director of Monsanto Chemicals Ltd. in London. Formerly he was located in St. Louis as assistant director of Monsanto's foreign department. He has been with the company since 1940. **T. G. Crane** has been appointed deputy managing director of Monsanto Chemicals (Australia) Ltd. He has been manager of the technical sales department of Monsanto Chemical Ltd. in England.

Holger C. Anderson, formerly research and development director of Hastings and Co., Philadelphia, and **Lawrence J. Reader**, formerly senior inorganic research chemist with General Chemical Co. and Wyandotte Chemical Corp., have joined the staff of the research laboratories of Foote Mineral Co., Philadelphia. **L. H. Belz** and **Harvey Stewart, Jr.** also have been added to the research and development staff.

Walter J. Hamer has been appointed chief of the electrochemistry section of the National Bureau of Standards. He has been with the bureau since 1935.

Daniel B. Altman has been appointed by the Kuljian Corp., Philadelphia, to head its new department of management engineering. He was formerly a partner in Hare, Bready & Co.

Harold Wittcoff has been put in charge of the product development section in the chemical research department of General Mills, Inc., Minneapolis, Minn. **O. A. Moe** has been named to head a process development section and **D. E. Floyd** to head a new chemicals section.

Thomas P. Kichline has been appointed pilot plant group leader at the Merrimac Division in Everett, Mass., of Monsanto Chemical Co. He joined the company's research department in 1942.

Louis A. Pardue has been appointed vice president of the Virginia Polytechnic Institute at Blacksburg, Va. He also will be dean of the graduate school. He has served as chairman of the Oak Ridge Institute of Nuclear Studies since January 1. **Herman E. Spivey** has succeeded him as dean of the University of Kentucky Graduate School.

Burvee M. Franz, formerly superintendent of the cartridge division, has been appointed assistant works manager of the Winchester Repeating Arms Co. division of Olin Industries, Inc. He will have direct supervision over the ammunition division, the inspection division and the explosives and technical control laboratories. Mr. Franz graduated from Rensselaer Polytechnic Institute in 1933 with a chemical engineering degree and came to Winchester the following year. **Leonard K. Brown**, formerly assistant cartridge superintendent, has succeeded Mr. Franz as superintendent.

J. B. Tinker, former manager of the Technical section, E. I. du Pont de Nemours & Co., Belle, W. Va., has been appointed departmental engineer of the polychemicals department in Wilmington. **W. Q. Smith**, assistant manager of the technical section, was promoted to manager and **J. L. Quinn**, former manager of the technical section at the Parkersburg plant, has assumed the duties of assistant manager of the Belle technical section. **L. T. Jilk** formerly at the company's Sabine River Works, has been appointed assistant manager of the plants technical section of the polychemicals department.

John H. Hilldring has been appointed general manager of foreign operations in charge of the newly created export division of General Aniline & Film Corp.

H. L. Barnebey has been appointed manager, and **Sanford R. Bell** process engineer, for the chlor-alkali department of Blaw-Knox Co.'s chemical plants division.

Homer H. Ewing and **Luis de Florez** have been appointed to the National Inventors Council. Mr. Ewing is with the developmental department of E. I. du Pont de Nemours, formerly in charge of its ceramic products department. Mr. de Florez is president of the de Florez Engineering Co.

Frank S. McKenzie has been appointed chief chemist and production manager of Liquid Sugars, Inc., Indianapolis. **Robert C. Connolly** has been made chief engineer.

John S. Kimble has been appointed assistant superintendent of the manufacturing operations at the Texas Division plant near Longview, Tex., of Tennessee Eastman Corp., Kingsport, Tenn. He was formerly assistant superintendent of the Tenite division. The following superintendents have been named: **C. A. Marshall**, formerly chief chemist in charge of the process improvement staff in the acids division; **Z. E. Rice**, formerly superintendent of the butyric acid department; **Jack Vander Woude**; **J. P. Gillespie**, formerly senior electrical engineer in the engineering field group.

(Continued)

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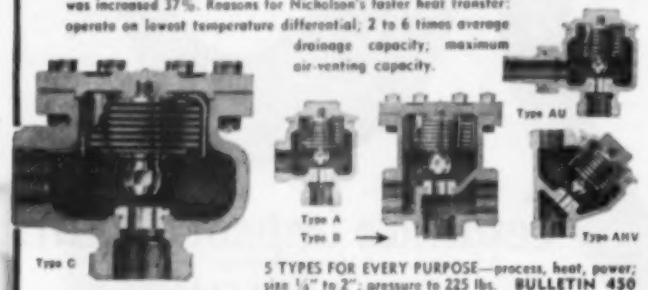

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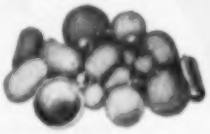

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NAMES IN THE NEWS, cont. . .

Carroll L. Wilson, who has served as general manager of the Atomic Energy Commission since its inception, has resigned. **Carleton Shugg,** deputy general manager, will serve as acting general manager.

Erwin H. Amick, Jr., associate professor of chemical engineering at Columbia University, has been appointed to the new post of associate dean of the school of engineering.

E. Bruce Ashcraft has been appointed to the post of advisory engineer for the chemical department of the Westinghouse Research Laboratories, Pittsburgh, Pa. He returns to the laboratories after a four-year absence during which he supervised research in three major atomic energy centers. He has been succeeded in his most recent post as manager of chemistry research at Westinghouse's atomic power division by **D. M. Wroughton.**

H. L. Wolcott has retired as active manager of the Orange, Tex., plant of E. I. du Pont de Nemours. He will remain in an advisory capacity. He has been succeeded by **Donald B. Campbell,** formerly manager of the company's cellophane plant at Clinton, Iowa.

Richard Moffatt has been appointed chief senior process engineer at the Marietta, Ohio, plant of the Calco Division of the American Cyanamid Co. He succeeds **John W. Dersch** who has been transferred to the Bridgeville, Pa., plant.

John A. Mulheren has been appointed advertising manager, H. K. Porter Co., Pittsburgh, Pa. He was formerly manager of sales promotion and market research for *Chemical Engineering* and *Food Industries* magazines.

Bert S. Taylor, formerly factory manager of the B. F. Goodrich Co., plastics division, has joined Ohio-Apex, Inc., Nitro, W. Va., as manager of the development department.

C. E. Simpson has joined R. S. Aries & Associates, New York, as a senior associate. He has been associated with Carrier Corp.

Edward J. Schwoegler, former technical director of Nox-Rust Chemical Corp., Chicago, has joined the staff of Armour Research Foundation of Illinois Institute of Technology as

a research organic chemist. Prior to joining the company in 1947 he was senior technologist for Sinclair Refining Co., East Chicago, Ind.

Arthur C. Greber has been appointed chief engineer of Schenley Distillers, Inc. He has been serving as engineering manager since 1945.

A. H. Waitt

Alden H. Waitt, former chief of the Chemical Warfare Service, has joined R. S. Aries and Associates, New York, as vice president. He had been with the Regular Army from 1920 until his retirement in 1949. He is a graduate of Massachusetts Institute of Technology.

Richard P. Carter has been appointed assistant superintendent of the Hercules Powder Co. plant at Burlington, N. J. He has been the plant's chief chemist for over a year.

E. F. Degering has joined Miner Laboratories, Chicago, where he will head a group working on problems of organic synthesis. He has been with the chemistry department of Purdue University, then with Armour Research Foundation.

H. Alvin Smith, formerly executive vice president of John Powell & Co., New York, has been elected president. **W. J. Pollert**, previously in charge of production, has been put in complete charge of all operations.

Arthur E. Brown and **Seymour Polansky**, chemists, have joined the process development department of Grasselli Works Division, General Aniline and Film Corp., Linden, N. J. **James F. St. Clair** has been named a senior control chemist in the intermediates department. **Franklin A. Retzke** has been ap-

(*Continued*)

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pointed a junior chemical engineer in the chemical engineering department. **David Roller** has been named a chemical engineer trainee in the special products area.

John E. Boeheim has joined the staff of Evans Research & Development Corp. as a research assistant. He is a graduate of St. Lawrence University with a degree in chemistry.

Howard F. Bauman has received the Chicagoland Paint Industries 1950 fellowship in chemical engineering at Illinois Institute of Technology, Chicago. **John B. Sachs** has received the 1950 Mixing Equipment Co. fellowship in chemical engineering. **Irving R. Dunlap, Jr.** has received the chemical engineering fellowship of the Standard Oil Co. of Indiana.

F. E. Murphy

Francis E. Murphy has been appointed production supervisor of the Wyandotte works of Pennsylvania Salt Mfg. Co., Philadelphia. He will be in charge of all chemical plant operations. He joined the company in 1943 as assistant to the manager of research and development.

Alexander J. Wuertz has retired after 31 years as a chemist with E. I. du Pont de Nemours & Co., Wilmington.

Mitchell E. Penn has joined the staff of the Technical Command, Army Chemical Center, Md., as a chemist. Other additions are **Philip W. Krey** and **Robert B. Price**, physical chemists; **Richard G. Smith**, chemist.

Kenneth A. Danskin has joined the Lubrizol Corp., Cleveland, as technical assistant to the vice president

in charge of manufacturing. Prior to this he was a staff member of the Texas Co.'s technical and research division in New York.

R. Chris Nitschke has joined Rockwell Mfg. Co. as a project engineer on petroleum products. He was formerly with Standard Vacuum Oil Co. as assistant chief engineer.

Gustav Egloff, director of research, Universal Oil Products Co., Chicago, has been elected a member of the Society of American Military Engineers, Washington, D. C.

William I. Caldwell, member of the research department of Taylor Instrument Cos. since 1937, has been appointed director of research.

Alvin E. May has joined the staff of Truesdail Laboratories, Inc., Los Angeles, as assistant to the president. He was formerly with Sharples Corp., Philadelphia, as process engineer.

Milton A. Dewey has resigned after 13 years in petroleum chemicals research and sales with E. I. du Pont de Nemours & Co., Wilmington. He has been named to head a newly created tetraethyl lead sales department in Canadian Industries Ltd. His headquarters will be in Toronto.

William C. Howard, a graduate of Case Institute of Technology with a degree in chemical engineering, has been assigned to the Atlanta, Ga., sales office of Taylor Instrument Cos. **Benjamin W. Steverman** has been transferred from the Cleveland to the Pittsburgh office.

Henry M. Sossaman has been appointed general sales manager of Quaker Rubber Corp., division of H. K. Porter Co., Philadelphia.

William H. Trotter has been appointed to handle the sales promotional activities of the chemical division of Celanese Corp. of America, New York.

Roy W. Maze has been made merchandising sales manager of the Marley Co., Kansas City, Kan.

Kenneth W. Lincberry has been elected president of Black, Sivalls & Bryson Inc., Kansas City, Mo. He was formerly vice president and director of F. S. Yantis & Co., Chicago; he succeeds **A. J. Smith** who has resigned.

(Continued)

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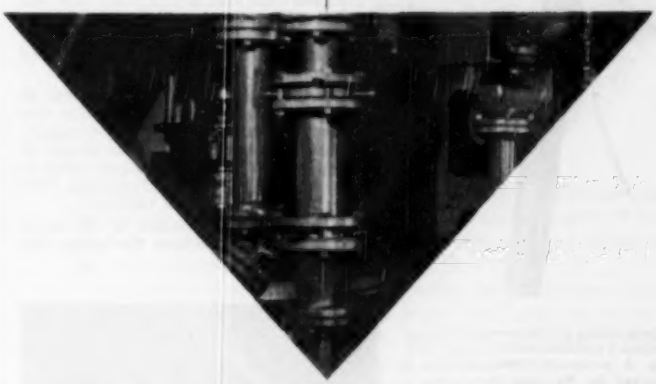
resists corrosion



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Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches inclusive. Also available are saran lined plug valves, Saunders type diaphragm valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

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A User of Acid Sludge Pumps Reports:

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His Solution: He tried *Spraywelding** a few discarded rods with *Colmonoy No. 6*, an extremely wear and corrosion resistant hard-facing alloy. He then found that the packing lasted sixty hours, almost eight times as long as before (Colmonoy No. 6 has a very low coefficient of friction), and that the average Spraywelded rod didn't require replacement until working 573 hours, better than 22 times the life of a new rod.

Not only did the hard-faced pump rod outlast a new one many times over, but it cost less than half as much as a new rod to start with. Added to this were the impressive savings found in reduced maintenance labor, and in less lay-up time of the pump.

Colmonoy stands for a complete line of hard-facing alloys. Only a complete line can meet the various challenges of impact, abrasion, and corrosion, either singly or in combination. Colmonoy alloys come in forms to suit many applications: rod, paste, powder, wire, and castings.

Write for general literature or tell us of your particular problem for more detailed information.

*Spraywelding is a Colmonoy hard-facing process. It combines metallizing and welding. A powdered Colmonoy alloy is sprayed on the worn part, using a powder metallizing gun called the Spraywelder. The overlay is then fused, or welded to the part with a standard acetylene torch.

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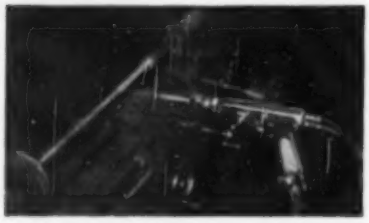

The Spraywelder, shown spraying a pump rod used in handling caustic solutions.

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NAMES IN THE NEWS, cont. . .

Leslie G. Jenness has been appointed assistant to the president in charge of research for Kennecotte Copper Corp. For the last three years he has been director of research of the Hum Ko Co., Memphis, Tenn. Prior to that he was division head of Linde Air Products Co. in charge of inorganic research and development.

R. L. Frank

R. L. Frank has been appointed director of research for Edwal Laboratories, Inc. of Ringwood, Ill. He has been on the faculty of the department of chemistry at the University of Illinois since 1940. **Morton Schwarcz**, formerly chief chemist in charge of research, has been put in charge of coordination and administration of special projects and contract manufacturing.

Frederick G. Keyes has joined Alfred Bicknell Associates as director of research and development. In 1922 he was appointed chairman of the department of chemistry at Massachusetts Institute of Technology where he remained for 23 years.

Robert W. Satterfield has been awarded the James S. Kemper Foundation graduate fellowship in industrial hygiene engineering at Harvard University's school of public health. He was graduated in chemical engineering from Northwestern University in 1949.

Courtland F. Carrier has been appointed technical adviser of the fabricating division of the Western Brass Mills division of Olin Industries.

Carl E. Baird has been appointed manager of the Tulsa office of the chemical plants division of the Blaw-Knox Co.

Ray C. Hansen, Jr. has been named sales engineer of the National Tank and Pipe Co., Portland, Ore.

Bennett M. Coons has been named plastic molding powders salesman for the Chicago area for Dow Chemical Co., Midland, Mich.

OBITUARIES

George W. Pressell, executive vice president of E. F. Houghton & Co., Philadelphia, died on June 5.

George M. Pohler, 38, senior project engineer for the Vulcan Copper & Supply Co., died in his home in Cincinnati July 9. A chemical engineering graduate of the University of Illinois, he has done considerable work in the field of distillation and alcohol plant design and was a pioneer in high vacuum distillation on a commercial scale using packed and spray columns.

Harold S. Arnold, 63, technical assistant to the president of the International Nickel Co., New York, died August 7. Mr. Arnold joined International Nickel in 1914 at its physical testing laboratory in Bayonne, N. J.

James E. Mills, 74, chemical research director for the Sonoco Products Co., Hartsville, S. C., died in Charlotte, N. C., August 12. In 1944 he received the Herty Award given by the Georgia section of the American Chemical Society.

Arthur J. Girouard, 54, president of the Wonder Chemical Co., Springfield, Mass., for 28 years, died at Westfield, Mass., August 14.

Herbert N. Dawes, 78, consulting engineer, died at Brookline, Mass., August 14.

George Dawes Van Arsdale, chemical and metallurgical engineer of the Dorr Co., Stamford, Conn., died August 24. A graduate of Princeton University, he was known for his contributions to the development of metallurgical processes for the treatment of low-grade copper deposits of the southwestern United States.

Frederick J. Farr, president of the Brookline Chemical Co., Brookline, Mass., died at Waban, Mass., September 3.

John M. Angier, 41, president of the Angier Corp., Framingham, Mass., died in that town September 4.

HELICOID
Chemical Gage

Standard dials: 0-15, 30, 60, 100, 150, 200, 300, 400, 500, 600, 800, 1000, 1500, 2000, 3000. Also 0-30" vac., 15 and vac., 30 and vac., 60 and vac.

Supplied with Cartridge Snubber in socket for pump service.

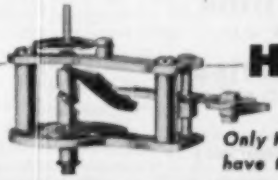
Removable bottom part and Diaphragm ring available in:

Bronze
Cast Iron
Lead Coated Iron
Steel
Stainless Steel (316)
Monel
Hastelloy B
Hastelloy C
Durol (24 S-T)
Carpenter No. 20 (Duramet)
Nickel
Everdur
Hard Rubber

● Here's a chemical gage for any pressure to 3,000 p.s.i. and also for vacuum or compound ranges, and temperatures to 300° F. Particularly suitable for chemicals and other viscous liquids that either corrode or clog a Bourbon tube gage.

One feature of this Chemical Gage is that the diaphragm is made of "TEFLON" which is flexible and resists practically all corrosive chemicals. No fragile metal foils are used. The diaphragm chamber is supplied of any metal most suitable for the service.

Available in the following dial sizes: 4½", 6", or 8½". 1" female N.P.T. bottom connection. Flanged connection also supplied.



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HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE COMPANY, INC.
Bridgeport 2, Connecticut

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McBEAN CONTINUOUS DRYING TUNNEL

featuring

KATHABAR HUMIDITY CONTROL

. . . for high-speed drying of glues, gelatins, etc.

The answer for drying substances which do not withstand high temperatures of conventional drying methods has been recently introduced to industry. Designed by Douglas M. McBean, well-known food processing engineer, in cooperation with Kathabar humidity control engineers, the new drying tunnel employs very dry air to extract moisture. In actual installation on glue drying lines, the new drying system achieves faster drying action at close to room temperatures . . . and gives greater low-temperature drying capacity in less space. In addition, the McBean Continuous Drying Tunnel is available as a complete unit thereby concentrating the responsibility for installation and correct operation in one source.

Heart of this new continuous drying tunnel is KATHABAR, the widely utilized system of humidity control for industrial processes and comfort. KATHABAR controls the humidity of the entering air accurately and automatically, regardless of the moisture content of the incoming air.

Write today for the complete story and drawings on the new McBean Dryer and KATHABAR.

Kathabar

HUMIDITY CONTROL SYSTEM

MANUFACTURED BY

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CORPORATION

TOLEDO 1, OHIO

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TOLEDO 1, OHIO
Please send McBean Dryer Story to:
Name_____
Address_____
City_____
Zone_____ State_____

DEPARTMENT OF THE MONTH

Industrial Notes

(*Continued from page 123*)

Pemco Corp., Baltimore—Expanded plant facilities which will add more than 30,000 sq ft. of floor space. Construction is expected to be completed by November 1950.

Southern Cotton Oil Co., Cartersville, Ga.—A fertilizer plant to have floor space of over 24,000 sq. ft.

Swift & Co.—Rebuilt facilities at its fertilizer plant in Atlanta, Ga. Capacity will be about 1,000 tons a day, operations to begin soon.

Superior Electric Co., Bristol, Conn. —A Cleveland office to serve the Ohio and western Pennsylvania areas. The office will be headed by Harold W. Lorenson.

Beacon Chemical Industries, Inc., Jamaica Plain, Mass.—A plant in Cambridge, Mass., which it will occupy within a few months.

Foxboro Co., Foxboro, Mass.—Two branch offices: one in Wilmington under the managership of Kenneth L. Barton, and another in Minneapolis with Robert C. Cahill as resident engineer.

Monsanto Chemical Co.—A plant at Long Beach, Calif., to manufacture polystyrene molding compound. This is the first such plant on the Pacific Coast.

Victor Chemical Works, Chicago—A $5 million elemental phosphorus plant to be built near Silver Bow, Wyo. Nicholson Co., Inc., New York, has the general contract. At the plant site, T. F. Edson is in charge for Victor.

Bechtel Corp.—Two buildings at 101 California St., San Francisco, for the purpose of bringing together the company's engineering groups, which are at present scattered at several points in the city. The new buildings are expected to be ready for occupancy early in 1951.

New Companies

Loren V. Burns & Associates, Kansas City, Mo., to provide technical counsel and specialized nutritional and technical services for the feed industry.

Plastics Corp. of America to manufacture plastic wall tile. The company has recently leased a plant at Circleville, Ohio.

Russell Engineering Corp., Houston, to specialize in design and engineering of natural gas and petroleum processing equipment. The firm is headed by George F. Russell, consulting chemical and petroleum engineer.

New Representatives

Buffalo Forge Co. and Buffalo Pumps, Inc., Buffalo, N. Y. have appointed Johnson and Norman to represent them in Metropolitan New York and Newark.

Ajax Flexible Coupling Co., Westfield, N. Y., has appointed the Samson Sales Co. as its San Francisco representative. Thurlow Equipment Division of G. Donald Bradley Co., Seattle, Wash., will represent Ajax in Washington, Oregon and Idaho on all products except flexible couplings.

Raybestos-Manhattan, Inc., Passaic, N. J., has appointed the California Division of National Supply Co. as distributors of its rubber and asbestos products for the California oil fields.

Flexitallic Gasket Co., Camden, N. J., has made Power Specialty Co., Houston, its distributor in eastern Texas and western Louisiana. The Metrol Co., Detroit, Illes Power Control Co., Cleveland, and Airdraulic Equipment Co., Buffalo, N. Y., are new agents.

General Aniline & Film Corp., New York, has announced that sales of its detergents, emulsifiers and chemical specialties will be handled by General Dyestuff Corp.

Edward Valves, Inc., East Chicago, Ind., has appointed I. Russell Berkness Co., Richmond, Va., as sales and service representatives in the state of Virginia.

—*End*

13 YEAR TORTURE TEST
...STILL LIKE NEW!

QUAKER PACKINGS

Provide Positive Seal . . . Retain Flexibility Despite High Temperatures and Pressures

Here's a seat gasket cut from Ebonite Sheet Packing that rolled up thirteen years of trouble-free service on a pop-off pressure relief valve in a southern plant . . . withstanding high temperatures and pressures . . . eliminating leaks and shutdown time...assuring absolute safety. Only extensive changes requiring different sized gaskets made it necessary to replace this gasket at all!

Performance like this is made possible because of Ebonite's remarkable leak-proof characteristics and the fact that it will not carbonize, melt or become hard. That's why Ebonite is ideal for high pressure joints and flanges; for use with superheated steam, ammonia, brine, air, oils, acids, caustics, gases, hot or cold water.

For all your requirements—whether packings or belting for conveying materials . . . flat or V-belts for driving steam engines, steam turbines or electric motors . . . hose for flushing, suction, cleaning or fire fighting purposes—see your Quaker distributor, or write direct to us.

HOSE FOR RUGGED WEAR

Hose for air, steam, water, oil, gas or paints, Quaker makes it to fit the needs of the Chemical Industry. Each is pre-tested for peak performance.

BELTING FOR MAXIMUM HORSEPOWER

Flat belts or V-belts, Quaker has the one to fit the drive . . . to transmit maximum horsepower at the lowest operating cost . . . all pre-tested to assure peak performance.

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custom made for every industrial use

"Sacré Bleu", exclaimed LaSalle "such progress I've never seen"

To far-seeing business management it is apparent that the next half century will see the Southwest emerge as the greatest industrial area in the United States. Vast natural resources, assured low-cost power, temperate climate, and centrally located for low-cost distribution, this area offers management the geographical area ideal.

Brown & Root offers you experienced counsel, backed by more than thirty years of successful engineering and construction in the great Southwest. Their "know-how" may result in faster, more economical completion of your proposed project. A request will put Brown & Root plant-planning experts at your disposal.

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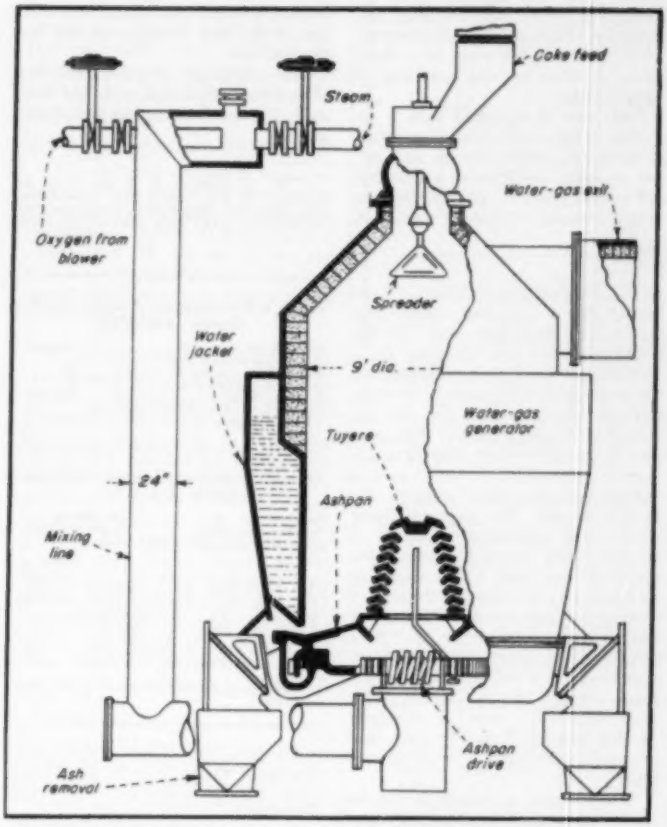
Quotes, Extracts and Digests

MORGAN M. HOOVER, Assistant Editor



Oxygen and steam fed continuously permits simplification of this standard UGI blue gas set which was designed for intermittent air and steam blasts.

Use of Tonnage Oxygen Simplifies Water-Gas Production Set

J. W. Blatchford

Production of water gas from coke is one of the basic processes at the Belle Works of the Du Pont company and has been employed on a large scale for a number of years. After extensive study of process economics and discussions with firms engaged in the design and operation of air separation plants, it was decided that installation of a base load oxygen plant and conversion of a portion of the existing gas generation equipment was in order. Accordingly a contract was agreed upon with the Linde Air Products Co. to design, build and operate an oxygen plant with a capacity of approximately 360 tons per day.

Several standard UGI mechanical blue gas sets were converted for oxygen service. Each set consisted of a generator, automatic fuel charger, combustion chamber, waste heat boiler and wash box with the conventional air and stack valves, steam and gas reversing valves, automatic cycle controller and hydraulic system.

Conversion of the cyclic generator sets was actually a simplification of the apparatus. The combustion chamber was dismantled and the generator was connected directly to the waste heat boiler. The air valves, steam and gas reversing valves and piping and the mechanical-hydraulic automatic cycle controller were removed. A connection for mixing oxygen and steam, with the necessary control valves, was installed at the operating floor level adjacent to the fuel charger and piped to the base of the generator. The final arrangement is essentially that of an updraft producer.

The generators are 9 ft. in diameter and approximately 9 ft. high. The diagram shows the generator, fuel charger and oxygen-steam mixing line. The generator is water jacketed for the lower two-thirds of the normal fuel bed depth. Steam is generated in the jacket and piped to the low pressure steam system. The fuel bed is supported by a solid ashpan on which are mounted four plows or pusher angles and a central tuyere through which the oxygen-steam mixture is admitted. The ashpan rotates on a flat bearing surface supported by a base casting fastened to the outer shell. The ashpan is driven by means of a ring gear, a worm gear, reduction gear and a variable speed motor. As the ashpan rotates, ash at the bottom of the fuel bed is plowed to the annular space under the jacket bottom. Two stationary plows fastened to the outer shell, 180 deg. apart, divert the ash to the ash hoppers. The ash hoppers are equipped with double doors to permit dumping while the unit is in operation. The tuyere consists of a stack of spaced rings, diminishing in diameter from bottom to top and covered by a cap. The rings are of herringbone cross section and the sections overlap to prevent ash and fuel from falling into the bottom connection of the generator. The water jackets are fitted with three rodding tubes which extend from the inner

(Continued)

QED, cont. . .

wall through the water space and outer wall. These tubes are at the elevations of the top, middle and bottom sections of the tuyere and are spaced 90 deg. apart. The generators are shut down periodically and steel rods are inserted through the tubes, allowed to remain in the fuel bed for a short time and then removed. The location and depth of the ash zone is determined by the position and length of the hot portion of the rods.

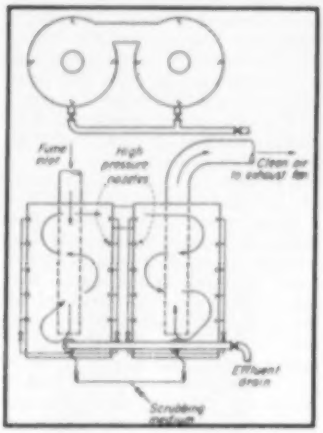
Coke is fed from an overhead bin to a standard charging device equipped with a spreader and outer door. These are hydraulically operated and automatically controlled.

The charger body is swept with low pressure steam during the period that the spreader is in the open position to prevent accumulation of combustible gas that might ignite when the hopper door is opened to admit coke to the charger. The timer and control valves are interlocked in such a manner that each operation must be completed before the schedule can proceed. Manual controls are provided for use in the event of a timer failure or when starting new fires in the generator.

Each unit is equipped with a recording oxygen and steam flowmeter, an automatic carbon dioxide and oxygen analyzer, multipoint pyrometer, differential pressure recorder and an ashpit pressure indicating gage. A product gas meter, oxygen pressure and temperature recorder and remote controls for shutting off the oxygen supply to the blowers are grouped on a separate panel. An annunciator and alarm system are also mounted on this panel which indicates excessively high or low offtake gas temperature, high or low carbon dioxide content of product gas and any operational failure of the fuel chargers on the individual sets.

The centrifugal oxygen blowers are of conventional design with cast iron shells and stainless steel impellers and shafts.

J. W. Blatchford, E. I. du Pont de Nemours & Co., before the Production and Chemical Conference, American Gas Association, New York, May 22-24, 1950.



Fog filter is better than spray tower.

Fog Filter Traps SO_2, H_2S, and Fatty Acid Vapors

E. P. Kropp

Results with an experimental fog filter have been so promising that two full scale units are being installed for the control of sulphur dioxide, hydrogen sulphide, and fatty-acid odors at the Cleveland refinery of the Standard Oil Co. of Ohio. Preliminary work with conventional spray towers showed them to be unsatisfactory.

EXPERIMENTAL FOG FILTER UNIT

The general characteristics of the unit are indicated in the drawing. Essentially the equipment consists of two cylindrical spray chambers connected by a cross-over duct. The fumes are conducted close to the bottom of the first chamber by a central inlet tube; then they pass up the cylinder in a centrifugal motion, through the cross-over duct to the second cylindrical chamber. The gases pass down the second chamber in a centrifugal motion and, finally, up and out through a central tube in the second chamber. The gases are drawn through the equipment by means of an exhausting blower located on the outlet of the unit. The scrubbing medium was introduced through a number of fog nozzles. These fog nozzles were placed at an angle around the periphery of the cylindrical chamber so as to induce a rapid centrifugal motion of the gases. This centrifugal action served to disengage the fog droplets from the gases, and prevented entrainment of odoriferous mist.

A high degree of atomization of the scrubbing medium is necessary in cases of difficult gas absorption, odor removal, or dust removal. To insure a high degree of atomization, the apparatus was equipped with a pump which maintained a pressure of 350 to 400 psig. at the nozzles.

SULPHUR DIOXIDE ABSORPTION

The absorption of the sulphur dioxide portion of the fumes from the acid treating of lubricating oil presented the most difficult problem. Trial runs were made in which the conditions simulated those found in the plant.

A 3 percent solution of soda ash in water was used as the scrubbing medium. At a concentration of 10,000 ppm. of sulphur dioxide, at an air rate of 100 cfm. and at a spray rate of 20 gpm., the sulphur dioxide concentration was reduced to less than 1 ppm. Typical results are summarized in Table I.

From these experimental data it was concluded that the fog filter type of scrubbing unit gave a satisfactory removal of the sulphur dioxide.

Table I—Experimental Results, Sulphur Dioxide Absorption

Inlet concentration, ppm.	10,000
Outlet concentration, ppm.	0
Inlet temperature, deg. F.	50
Outlet temperature, deg. F.	40
Scrubbing liquid	Soda ash
Concentration of scrubbing liquid, percent by weight	3

Table II—Experimental Results, Hydrogen Sulphide Absorption

Fume rate	880-1,000 cfm.
Rate of scrubbing liquid	20 gpm. at 400 psig.
Approx. temp. of scrubbing liquid	70 deg. F.

Inlet Conc., Ppm.	Outlet Conc., Ppm.	Inlet Temp., Deg. F.	Outlet Temp., Deg. F.	Scrubbing Liquid	Conc. of Scrubbing Liquid, % by Wt.
4,200	3,900	200	115	Recycle water	.....
2,200	200	200	100	Soda ash	3
2,100	50	50	40	Soda ash	3
45,200	0-50*	50	40	Caustic soda	8.5
2,000	0	50	40	Caustic soda	8.5

* Concentration at outlet increased as caustic rapidly became spent.

HYDROGEN SULPHIDE ABSORPTION

Due to the success of the fog filter on sulphur dioxide absorption, an experimental program was carried on to determine the feasibility of using this equipment for hydrogen sulphide absorption. Presented in Table II is a summary of several of the experimental runs.

The first trial was made with water as a scrubbing medium. It was found that water was relatively ineffective. A second trial with a 3 percent soda ash solution reduced the hydrogen-

(Continued)

Table III—Spray Tower Operating Conditions With Sulphur Dioxide

Inlet conc., ppm	1,500
Outlet conc., ppm	1,400
Fume rate, cfm	1,000
Inlet fume temp., deg. F	212
Outlet fume temp., deg. F	120
Water to scrubber, gpm	20 at 40 psig.
Inlet water temp., deg. F	60
Outlet water temp., deg. F	150

sulphide concentration in an air stream of 1,000 cfm. from 2,200 to 200 ppm. To achieve a higher absorption efficiency, an 8 percent caustic soda solution was used. This solution completely removed hydrogen sulphide from air even with an inlet concentration of 45,200 ppm.

FATTY ACID ODOR ABSORPTION

It is inherent in grease manufacture that fatty acid odors are present. Under certain atmospheric conditions the offensive quality of these odors is accentuated. By the use of the fog filter it was found that these odors can be completely absorbed, using water as a scrubbing medium.

SPRAY TOWER UNSATISFACTORY

A preliminary pilot plant investigation of a conventional spray tower for SO_2 removal was made. The purpose of this investigation was to determine whether this simple form of apparatus might be applicable. The tower consisted of a vertical 20-in. dia. pipe having an effective spray section 18 ft. long. The spray was furnished by a single spray nozzle located at the top of the tower. The fumes were passed countercurrent to the spray, and were discharged from the top of the tower. The results of scrubbing the fumes from the sludge separators using the spray tower are shown in Table III.

Within the foregoing range of conditions, the removal of sulphur dioxide from the fumes was negligible. It was obvious that this equipment did not solve the problem of removing sulphur dioxide from the fumes.

E. P. Kropp, Standard Oil Co. (Ohio), before the American Petroleum Institute, Cleveland, May 3, 1950.

INDUSTRY

. . . and the College Product

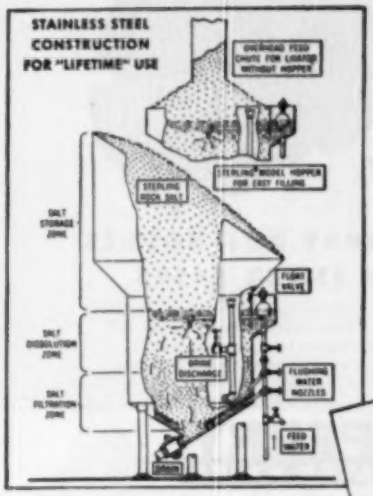
Paul D. V. Manning

It is to the advantage of all three participants, the man, industry and the educational institution, to develop a system whereby the transition phase may be made easier and the time required shortened as much as possible.

What can the first party, the graduate, do to aid himself in this program? We believe he can prepare

(Continued)

SALT! WHY HAUL IT? MEASURE IT? STIR IT?



Just Turn It On!

STERLING ROCK SALT BRINE DELIVERED BY PIPE TO EVERY POINT OF USE IN YOUR PLANT—

HOW LIXATOR WORKS

In the dissolution zone — flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. **In the filtration zone** — through use of the **self-filtration** principle **originated by International,** the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

WHAT THE LIXATOR PROVIDES

- ✓ **Chemical and bacterial purity to meet the most exacting standards for brine.**
- ✓ **Unvarying salt content of 2.65 pounds per gallon of brine.**
- ✓ **Crystal-clear brine.**
- ✓ **Continuous supply of brine.**
- ✓ **Automatic salt and water feed to Lixator.**
- ✓ **Inexpensive, rapid distribution of brine to points of use by pump and piping.**

Savings up to 20% and often more in the cost and handling of salt have been reported by many Lixate users. Why not investigate?

• You can eliminate shoveling, hauling, and laborious hand stirring of salt and water, and frequent testing of the brine strength—with International's Lixate Process for Making Brine. Stops waste through spilling. Saves time and labor. Assures accurate salt measurement . . . no guesswork.

• In the production of chemicals, leather, textiles, plastics, soap, sulphonated oils, petroleum products, food products, in refrigerating equipment such as spray decks and unit coolers, in regenerating zeolite water softeners, the Lixator provides an extremely easy way of measuring salt accurately in the form of brine. YOU SIMPLY TURN A VALVE for self-filtered, LIXATE Brine that ideally meets the most exacting chemical and bacterial standards for every use.

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The LIXATE* *Process*

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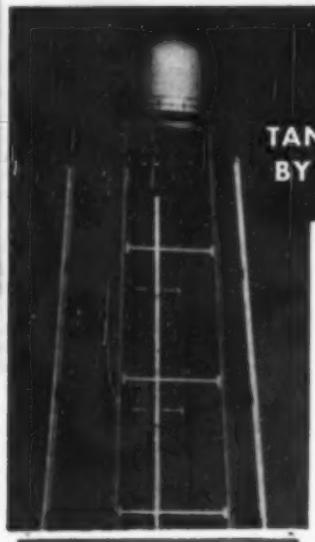

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• Cole has specialized in the design, fabrication, and erection of elevated tanks for four generations. This long experience enables us to handle your assignment with dispatch, and to your complete satisfaction.

Cole builds tanks, towers, vessels, cylinders, bins, etc., to your specifications—any size, any shape, any metal. Send us your inquiries. Write for catalog—"Tank Talk."

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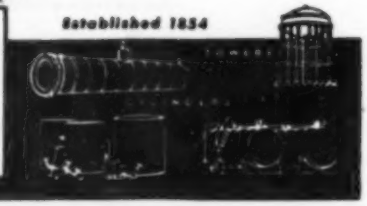

QED, cont. . .

himself more easily for the transition to an industrial position if during his college course he works towards the following qualities and attainments: (1) A good knowledge of the fundamentals of science and the fundamentals of the branch of engineering in which he is working. (2) Absolute and uncompromising integrity in thought and action. (3) A well developed ability to work with others and to make friends. (4) Good physical and mental health. (5) The ability to think, to reason, to analyze a problem and select its essentials. (6) A drive that makes him want to get things done and done correctly. (7) A good memory. (8) A knowledge of how and where to find facts he needs but does not have. (9) A burning interest in his work that transcends the desire for money or personal gain, plus a great pride in his profession. (10) The ability to use the tools of speech, economics, rapid reading, writing and English.

What can industry do as its part in adapting the college product to its needs? Of first importance is the need of giving the new technical graduate a thorough knowledge in the essential facts regarding the corporation, its history, its objectives, its policies and especially the theory and operation of its form of organization and management. The latter is of greatest importance. The effectiveness and efficiency of any employee depends finally upon how well he and his skill fit into the organization and how well he works with the others who make up the relatively small parts of the entire corporate structure. True team work means that all members work not for individuals but with individuals for the corporation. All of this is so important that it is worth spending considerable time and effort to insure that it is taught well.

During the time spent on his period of indoctrination, we believe it worth while to arrange for one carefully selected older employee to be assigned as an advisor to each new technical graduate. This will aid the latter in understanding the practical applications of the things he has learned.

Since the new technical worker is helping the corporation in its busi-

ANOTHER FIRST

"The chemical industry has shown the highest growth rate of any major segment of our economy. This rate of growth is three times as high as the average of all U. S. industry."

RAYMOND H. EWELL, *Manager*
Chemical Economics Service
Stanford Research Institute

ness, he ought to understand the figures giving the facts about its financial condition. A detailed explanation of its annual report and what it means is well worthwhile. Brief studies on the products, their uses, raw materials, specifications, markets and short outlines of the processes should be made.

It is the task of the industrial organization to accept the college product, carefully appraise each one and then train him so that his greatest potential productivity may be realized in his work. This, of course, requires some individual personal training peculiar to each man since his personality and ability are different from those of all other men. Putting it in the form of an equation, the total mental equipment required for any position minus the sum of natural ability, talent, education and experience previously received, will have to be provided by on-the-job training.

The chief concern of top management in industry is how to stimulate the young man entering the organization so that he will develop himself to the fullest extent of which he is capable. Every new employee is potentially a corporation president.

What can and should the university do to help prepare the technical graduate for his part in industry? We think this may be summed up in a very short statement. Teach him to think and to work!

Paul D. V. Manning, International Minerals and Chemical Corp., before the Division of Industrial and Engineering Chemistry, American Chemical Society, Chicago, Sept. 6, 1950.

FERTILIZERS

. . . Liquids Preferred

A. L. Mehring and G. A. Bennett

The nitrogen requirements of crops can now be met much more economically through the use of liquid ammonia than by solid fertilizers.

Liquid ammonia is run into irrigation water from steel cylinders. In the past few years liquid ammonia has also been used in special equipment for direct application to soil, especially in the Pacific Coast States and in the Mississippi Delta Area.

A study was made of delivered costs of solution and solid forms of nitrogen at typical fertilizer-producing points throughout the country over a period of years. It was found that liquid forms of nitrogen have been the cheapest at most points in the United States since 1926, but not at all points in every year. In 1944 the difference in delivered cost between liquid and solid forms of nitrogen began to increase and continued to a maximum in the spring of 1950.

(*Continued*)

Kemp Dynamic Dryers solve moisture control problems—combine dependable operation with low operating cost!

YES, no two ways about it, Kemp Dynamic Dryers *control moisture* at rock bottom prices. For example, a Kemp unit drying gas may cost you as little as ¼ *cent per mcf!* And that ¼ of a cent includes *all* labor and utility costs—plus the cost of the equipment amortized over a five-year period! But low operation cost is just part of the Kemp story.

SIMPLE OPERATION

Kemp Dynamic Dryers are flexible . . . offer *manual, semi-automatic* or *automatic* operation. Desiccant is especially selected and compounded for the particular duty. Units are available for drying *air, gases* or *liquids* . . . for controlling humidity in large or small areas. Choose gas, electric or steam regeneration . . . with or without cooling units.

GUARANTEED PERFORMANCE

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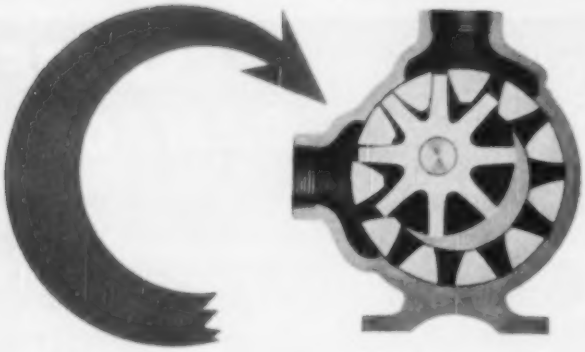

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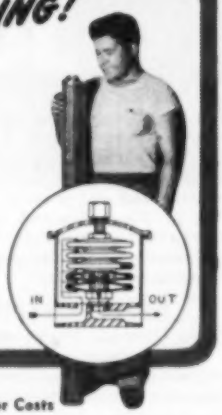

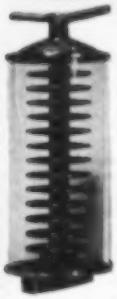

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- Save Maintenance and Labor Costs
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Micro Metallic Controlled Filter Porosity helps pass more fluid or gas and retain more solids. No replacements necessary in use. Easily and quickly cleaned. Micro Metallic Compact Filter Units Occupy as little as 1 sq. ft. per 100 gpm capacity. Available in 6 pore openings from 5 to 165 microns. Standard units with pipe connections from ¼" to 2". Special units to 10" pipe size can be ordered.

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QED, *cont. . .*

From 1942 until 1949 demand for fertilizer nitrogen exceeded the supply almost continuously. In the fall of 1949, production substantially caught up with demand.

Costs vary at different points according to distances from sources of supply. For example, around 1939 nitrogen was slightly cheaper in ammonium sulphate than in solutions, delivered at a fertilizer factory in Birmingham, Ala., or Baltimore, Md. At Richmond, Va., the reverse was true. Nitrogen at Richmond cost 1 c. per lb. more in ammonium sulphate.

During the 1949 season, liquid nitrogen was seven cents a pound cheaper than in ammonium sulphate delivered at some points in the southeast and 4¼ c. or more per lb. at all points in the United States except in the far west. Nitrogen was 3 c. per lb. cheaper in liquid form at the point of minimum difference, Los Angeles, Cal.

The low cost of liquid ammonia induces farmers to make the necessary investments so that they can handle it on the farm. The use of liquid ammonia on the farm grew rapidly in recent years to 69,000 tons in the year ended June 30, 1949. This usage will undoubtedly continue to grow if ammonia remains substantially cheaper than sodium nitrate, ammonium sulphate and similar materials.

The practical limit has largely been reached in the proportion of free ammonia that can be used in making mixed fertilizers.

A. L. Mehring and G. A. Bennett, Department of Agriculture, before the Division of Fertilizer Chemistry, American Chemical Society, Chicago, Sept. 5, 1950.

SYNTHETIC RUBBER
. . . Via Paper Mill Waste

K. A. Kobe and R. T. Romans

A large volume waste product of the paper industry, para-cymene, has been transformed into a raw material of great promise in the manufacture of synthetic rubber.

The chemical, para alpha dimethyl styrene, may replace or supplement styrene, which is one of the two principal ingredients of GR-S synthetic rubber, and which is already in short supply owing to the expanded synthetic rubber program.

Synthetic rubber made using PADMS has proved superior in tensile strength and more like natural rubber in processing characteristics than rubber made with styrene. Para-cymene is a by product in the sulphite pulping of spruce wood. The

sulphite pulp industry could produce much more para-cymene if a market could be found for it. It has been estimated by the United States Department of Agriculture that the United States and Canada could produce at least 1,300,000 gal. of para-cymene a year.

Of course, this amount is not being produced at present because the market does not exist for para-cymene, and hence it has not been economical for the pulp industry to install recovery equipment for this byproduct hydrocarbon.

The matter becomes one of relative economics. Can the woodpulp industry produce and sell the para-cymene at a sufficiently low price so that the synthetic rubber industry can use it to produce PADMS for production of superior synthetic rubber?

More work remains to be done on the problem of the properties of the synthetic rubber produced using PADMS. Many advances have been made in the GR-S rubber and polybutadiene rubber. Possibly these advances will give even superior products if PADMS is used. Certainly at this time the industry and the public should be interested in the production of superior grades of synthetic rubber, and if PADMS will do so, then we have a basis for a complete utilization of the para-cymene that has heretofore been wasted by the sulphite pulp industry.

K. A. Kobe and R. T. Romans, University of Texas, before the Division of Industrial and Engineering Chemistry, American Chemical Society, Chicago, Sept. 4, 1950.

PETROLEUM REFINING . . . *Advances*

F. H. Garner

The increased demand for a higher-quality gasoline, due to the development and use of the internal combustion engine over the past thirty years, has been the main factor behind the rapid advance of the American petroleum industry. The processes currently in use for increasing the

(Continued)

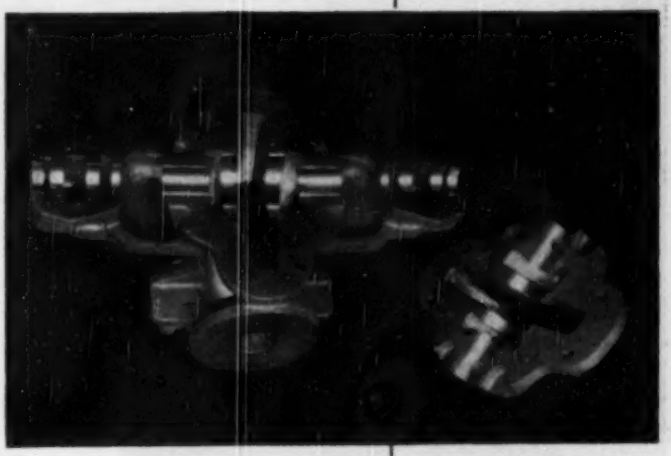
RESPONSIBILITY AND PRIVILEGE

"The chemical engineer is fundamentally important to theoretical scientists for the placing of their ideas into production, to financial interests for means of gainfully employing capital, to labor for creating new jobs and to the consuming public for new and better things at lower prices through the efficient application of technology."

L. A. Hatch, ***Vice President Minnesota Mining and Manufacturing Co.***

CORROSION . . . *Checkmated!*

WITH LEBANON STAINLESS CASTINGS



Finish-machined casting of a Centrifugal Pump Casing made at Lebanon of Circle L 32 Stainless Steel.

METALLURGISTS AND PRODUCTION MEN are pointing the way to corrosion control by the use of stainless alloys. These alloys range from the general purpose (19-9) to the highly specialized types, each particularly suited to service requirements. Lebanon Circle Ⓛ 22 (analysis at right) is a typical example of a stainless alloy that adds years of usefulness to any casting that must withstand corrosive attack.

Lebanon laboratory and production techniques play an important part in maintaining the high quality of our castings. Modern electric induction furnaces provide maximum flexibility of control so valuable in processing alloy material.

Our engineers are at your service, anxious always to help you solve your problems by developing entirely satisfactory castings.

If you do not have copies of our Data Sheets we will be glad to send them on to you.

LEBANON CIRCLE Ⓛ 22

NOMINAL ANALYSIS

Carbon Max.	0.08
Silicon	1.25
Manganese	0.75
Chromium	19.50
Nickel	9.00

NOMINAL PHYSICAL PROPERTIES

Tensile Strength	75,000
Yield Point	36,000
Elongation in 2" —%	50
Brinell Hardness	135

HEAT TREATMENT:
Water Quenched

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LEBANON *ALLOY AND STEEL* Castings

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sulphuric acid?

• In many cases where high purity sulphuric acid is not necessary, tremendous savings can be realized through the use of an appropriate grade of spent acid.

An interesting additional advantage worthy of investigation is this: some products made with spent acid have better physical properties than those made with high-purity acid.

We handle hundreds of tons of spent acids every day. These acids vary widely from high quality to low acidity, and are priced in proportion.

Industries that require large tonnages of low cost acid should give careful thought to locating in the Gulf Coast area where this type of material is available in great quantity. Write to us for information concerning the strengths and grades of spent acid that are available. We shall be pleased to assist you.

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QED, cont. . .

gasoline yield and quality over that obtainable by simple fractionation include the cracking of the distillate fuel oil and residual stocks, either thermally or catalytically, together with the polymerization, isomerization, and alkylation of the degraded gaseous products. Reforming of the heavy naphthas into high-grade gasoline is widely used, and it is expected that any further increases in octane number will have to be obtained by the reforming of straight-run gasoline stocks either thermally, or, for the highest grades, catalytically, as in the hydroforming operation. Unlike cracking, these operations do not convert desirable potential fuel oils into gasoline. Except for re-forming and the coking of residual stocks, thermal processing is steadily being replaced by the catalytic operation.

Compared with heating (60 percent) and power (38 percent), the efficiency of utilization of gasoline in transportation, only about 6 percent, is very low. A popular method of partly overcoming this has been to raise the engine compression ratio, which then requires fuel of a much higher octane number for knock-free operation. Both the yield and the refinery capital costs of producing gasoline of higher octane number are shown to be extremely high, and will remain so until better refining techniques are developed. As an alternative to this costly step, various methods are discussed whereby the anti-knock rating of the currently available fuel could be utilized more efficiently by the automobile manufacturers. The most recent of these is based upon the use of a small supercharged engine, together with aftercooling, an exhaust gas turbine, and an automatic transmission.

F. H. Garner, University of Birmingham (England), before the Fourth World Power Conference, London, July 14, 1950.

PUBLIC RELATIONS . . . *Fundamentals*

J. Handly Wright

The object of good public relations is to win friends for the industry and the corporate bodies that make up the

NUMBER ONE PROBLEM

"Our most difficult industrial problem now is not a technical one but creating an atmosphere in which employees will derive personal satisfaction from rendering service to the company."

WILLIAM R. SPRIEGEL, *Dean*
College of Business Administration
University of Texas

LARGE ASSIGNMENT

> **"The U. S. must treble its scientific manpower in order to maintain the knowledge stockpile now absolutely necessary for national survival."**
>
> **JOHN S. NICHOLS**
> ***Yale University***

industry. So public relations, boiled down to its simplest fundamentals, is good manners to win friends.

Too often we find people who regard public relations as the creation of favorable news through the public press, radio and magazines. This is a deceptively narrow interpretation of the subject. Press agentry would be a better name for that. Such a contention is based on the belief that public attention is public relations. As a matter of fact, public attention itself is not necessarily good public relations and is often fraught with risk. A good rule to remember about public relations is this: It is easy to attract public attention and to forfeit public respect. The old adage that "every knock is a boost" may be good press agentry, but it is bad public relations and definitely bad business.

In public relations, we are dealing with impressions—impressions held by the general public. And, as we all know, impressions are formed on the basis of actions. In the long run, we are all going to be remembered more by what we do than what we say. Everything we do contributes in some way to the public's impression of our industry, and the sooner we realize that our general public good will depends more on our actions than our words, the sooner we will understand the fundamentals of good public relations. In other words, if we seek public approval, we must first merit public approval.

One doesn't buy public relations like a sack full of potatoes. It isn't a commodity that can be purchased with a whopping assessment or a financial appropriation. It isn't even a responsibility that we can delegate to a department or an association.

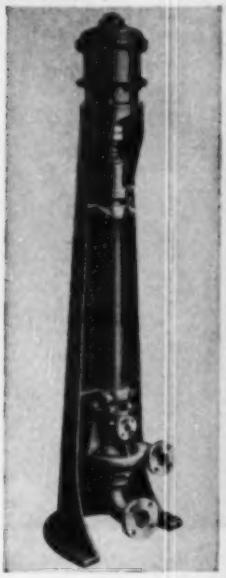
The point I wish to make is that public relations for the chemical industry and for the American industrial system itself begins with you. It is your actions that will determine what the public thinks of us. It is how you behave in your own community, how you treat your own employes and your general attitude toward the public at your front door that will determine ultimately what the public thinks of you.

J. Handly Wright, Monsanto Chemical Co., before the 75th annual meeting of the Manufacturing Chemists' Association, Spring Lake, N. J., June 19-20, 1950.

—*End*

(Right) Structural details of Lawrence Vertical Acid Pump.

(Below) Vertical Acid Pump for outside mounting.



VERTICAL ACID AND CHEMICAL PUMPS

The vertical acid pump illustrated here shows how Lawrence engineers met a particularly difficult pumping problem. Chemical action made it imperative to eliminate packing. While packing is used below the top bearing to confine fumes, it does not come in contact with the acid because the liquid level of the supply tank is kept below that point. This construction is typical of Lawrence advanced engineering design.

Other design features of Lawrence pumps for acids and chemicals include the use of metals and alloys carefully chosen to give the best possible protection against the corrosive and abrasive action of the liquid pumped, as well as structural strength and long wear.

If you have to pump any acid or chemical, hot or cold, write us the pertinent details. No obligation.

Send for bulletin 203-4 for a complete summary of acid and chemical pump data.

LAWRENCE PUMPS

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Improved eye appeal that won new customers for their product was the experience of this eastern chemical company with Celite filtration. The product, hydrochloric acid, is now filtered to perfect clarity with Hyflo Super-Cel, one of the nine available Celite Filter Aids.
HCL

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HERE'S WHY you can get a consistently *clearer, cleaner* filtrate by using Celite* as your filter aid:

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Chemical Engineer's Bookshelf

LESTER B. POPE, Managing Editor

The Operations of Chemical Engineering

UNIT OPERATIONS. By G. G. Brown, A. S. Foust, D. L. Katz, R. Schneidewind, R. R. White, W. P. Wood, G. M. Brown, L. E. Brownell, J. J. Martin, G. B. Williams, J. T. Banchero, J. L. York. John Wiley & Sons, New York. 611 pages. $7.50.

Where have all of our authors been? It is a quarter of a century since Arthur Little crystallized the concept of unit operations. Yet here we have the first book bearing the title "Unit Operations." Perhaps the job loomed too large. It looks that way because this "Unit Operations" took 12 authors seven years to finish. Why so many? Why so long?

"Many hands make light work." That's why there were so many authors. If it took 12 men seven years, it would take one man 84 years. Impractical. Also many authors mean many talents and specialties which, in turn, mean greater accuracy and completeness. (We see little evidence that "Too many cooks spoil the broth.")

The idea of the book evolved in the early 1940's from general dissatisfaction of chemical engineering staff members at the University of Michigan. About 1943 G. G. Brown, Banchero, White and York were teaching thermodynamics and unit operations to their wartime enrollment of servicemen. These professors abandoned as obsolescent the two heretofore standard texts. One was difficult to teach from; the other was not extensive enough.

They started leaning heavily on graphical methods and the practical description of equipment and its operating characteristics. Perry's Handbook became their text. They worked up lecture notes to include what should be covered. Brownell, Katz, Schneidewind and Wood were brought in immediately. Foust returned from military service in 1946. And in 1947 G. M. Brown, Martin and Williams were added to the growing list. Many other staff members participated in various ways at various times.

In all, the text has already been through at least three complete revisions, with some parts revised more. The notes, just as fast as they were available, were issued in mimeographed form to the students. Each semester saw partial revision of some material. Upwards of 1,000 students thus served as the authors' severest critics. All the kinks they found were hammered out. Actually the book reaches farther than the undergraduate level. And several classes of graduate students have contributed to it.

G. G. Brown
Captain of the Eleven

The biggest job the authors had was getting the illustrations together. They had plenty of cooperation but the press of work on all concerned interfered throughout the writing period. This getting it down on paper the first time was tedious; revisions came easier. At least 25,000 author-hours are represented in the finished product. And this does not include uncounted woman-hours spent in preparing the multitude of copies and revisions, the 100,000 student-hours spent in using and criticizing it.

Certain things were evolved at the beginning and proved desirable by experience in the classroom. These were (1) the change in sequence of subjects, (2) reliance on broad common principles, (3) graphical techniques, (4) plentiful pictures, (5) a large page.

1. Subject Sequence—Here is the greatest departure from convention. We don't find the traditional discussions: distillation, evaporation, filtration, etc. Instead "Unit Operations" is divided into four groups: solids; liquids; separation by mass transfer—the ideal stage concept; energy and mass transfer rates. Part I has four chapters: properties of solids, screening, size reduction, handling. Part II has 15 chapters covering properties, flow, measurement of flow, pumping, and other phases of fluid handling including fluidization of solids. Part III has seven chapters dealing with extraction, vapor-liquid transfer operations, and adsorption. Part IV, with 11 chapters, covers heat transfer, evaporation, crystallization, agitation, mass transfer, simultaneous heat and mass transfer. This grouping-by-similarities is going to help students. It will build their knowledge progressively. It also puts easiest material first and the hardest last.

2. Broad Principles—Emphasis is on broad common principles which cut all industrial lines. There is a complete divorce from operations based on equipment types. Advantages: common nomenclature; better student grasp of relationships between the unit operations.

3. Graphical Techniques—Emphasis here gives superior clarity of understanding and thinking.

4. Illustrations—551 of them help get across the accompanying discussions. Manufacturers' catalog cuts show equipment and operation. Drawings and charts present data.

5. Pages—The large size (8½ x 11) makes the book bigger than any other reference the student or engineer is apt to have (except notebooks). It does permit, however, data charts big enough to read and use.

The book is in for criticism: too

(Continued)

RECENT BOOKS RECEIVED

Colloid Chemistry. Vol. VII. Ed. by Jerome Alexander. Reinhold. $15.

Organic Syntheses. Vol. 30. Ed. by A. C. Cope. Wiley. $2.50.

Principles and Practice of Spectrochemical Analysis. By N. H. Nachtrieb. McGraw-Hill. $4.50.

The Technology and Chemistry of Alkaloids. By F. E. Hamerslag. Van Nostrand. $6.50.

big, too much emphasis on thermodynamics; too radical a departure from tradition. Maybe so, but right now it's the best there is.—*LBP*

Hazards & Pitfalls

CHEMICAL INVENTIONS AND CHEMICAL PATENTS. By Edward Thomas. Matthew Bender & Co., Albany, N. Y. 881 pages. $16.50.

Reviewed by A. W. Deller.

The present volume by Mr. Thomas not only brings up to date the substance of his previous "Law of Chemical Patents" but also, in the words of the author, is designed "to point out and describe the many hazards surrounding the work of the attorney who tries to put into words the abstraction called a chemical invention."

The book has been divided into 444 text units, which makes it easy to locate information relating to a particular problem. In addition, the various text units detail the numerous pitfalls which beset the writer of an application for a chemical patent. Approximately 5,500 cases have been digested or their effect incorporated into the running text. As indicative of the helpful character of the various text headings, the following may be noted as characteristic: "The Industrial Chemical Environment"; "Valuable Inventions Lost"; "Alternatives an Inventor May Follow"; "Some Difficulties Summarized"; "Laying Foundation for Broad Claims"; "Novel Empirical Products"; "Homologues and Analogues"; etc.

A number of chapters have a summary of illustrative decisions on the problems discussed, and in some chapters this summary is treated separately as an illustrative digest.

A novel aspect of the work is its plan of aiding in forestalling pitfalls in future contests when preparing patent applications. A major object of the book, therefore, is to point out pitfalls to be avoided in such a clear manner that stronger patents may be obtained and disaster avoided, such as from lost opportunities and lost contests.

Another helpful feature is that the author has cited each case to more than one set of reports where this has been reasonably possible. The subject matter of the several chapters has been classified under various schemes and sub-titles inserted to present the material in as clear a manner as possible.

The plan and substance of the work combine to render Mr. Thomas' book a comprehensive and practical treatise both for the inventor and the patent attorney.

Old & New Terms

GERMAN ENGLISH DICTIONARY FOR CHEMISTS. Third Edition. By A. M. Patterson. John Wiley & Sons, New York. 541 pages. $5.

An estimated 59,000 terms make up the vocabulary in this edition. The bulk of the additions are in the fields of chemical technology, electronics and warfare. Latest decisions in nomenclature are followed although the older names are included.

Use of the wording "dictionary for chemists" instead of "chemical dictionary" in the title has significance. It points out that the author did not simply make a collection of chemical words. Rather, he tried to gather in all knotty terms a chemist might be likely to run across in his technical reading. Caught in his net were a large number of words from such related fields as physics, biology, geology and metallurgy as well as from common parlance.

Special attention has been paid to prefixes, suffixes and abbreviations. Labels are used to indicate the field in which a German word has a particular English meaning. Many an-

(*Continued*)

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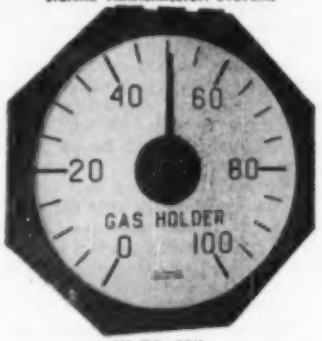

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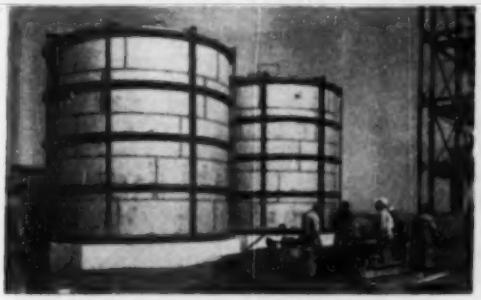
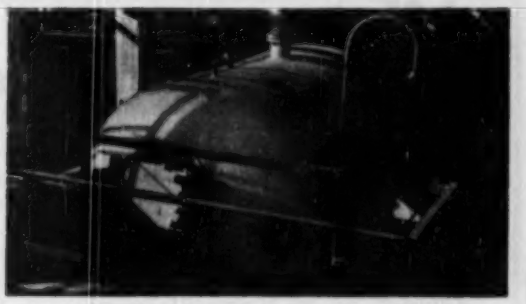
3 cases where equipment made of alloy metal solves a corrosion problem



1. **STAINLESS STEEL**—The two acid-feed surge tanks illustrated above were designed and purchased by the Chemical Construction Corp. of New York for installation at the Phillips Chemical Company plant at Etter, Texas. They store the nitric acid that is used in the manufacture of ammonium nitrate. The tanks are built of lightweight type 347 solid stainless steel plates with a carbon steel framing.



2. **MONEL**—This welded pressure vessel is used as a reflux accumulator for an atmospheric pipe still at the Baton Rouge, Louisiana, refinery of the Esso Standard Oil Company. It is made of 15 per cent monel clad steel plates with a backing of A-70 firebox steel and is designed for an operating pressure of 50 lbs. per sq. in. at 65 deg. Fahrenheit. The vessel was spot radiographed and shop tested at 115 lbs. per sq. in. before being sent to the customer's refinery.

3. **ALUMINUM**—The tank shown at the right is used to store the ammonium nitrate solution being produced at the Spencer Chemical Company's petrochemical plant in Military, Kansas. The shell and bottom are made of aluminum to prevent metallic contamination of the acidic salt solution during storage. The umbrella roof of the tank is made of carbon steel.

This tank was erected in a somewhat unusual way by one of our experienced field crews. The carbon steel sections were welded together on the tank's concrete foundation to make the umbrella roof. Each ring of the shell was completed alongside the tank site by welding the curved aluminum plates together. The tank was formed by assembling these three rings to the roof on the concrete slab.

In addition to the metals described above, we know how to fabricate other corrosion-resistant alloys like nickel, straight chrome stainless steel, and Everdur. We also furnish chemical plants with many carbon steel plate structures like flat-bottom tanks, elevated water tanks, and pressure storage tanks. Write our nearest office for estimates or quotations.

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at LEADING CHEMICAL PLANT

One of the country's largest manufacturers of chemicals and plastics came to NETTCO with this problem: They needed an agitator to mix highly corrosive materials in a tank 7' diam. by 35' long. The unit also had to be completely removable without the necessity of personnel entering the tank.

NETTCO answered the customer's special requirements with this flange-mounted agitator — a unit constructed of standard NETTCO components. Here are its outstanding features:

1. Large flange makes possible removal of entire stirrer without the necessity of personnel entering the tank.
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3. Because entire unit is supported from a single flange, it is adaptable to applications where tank top space is a factor.
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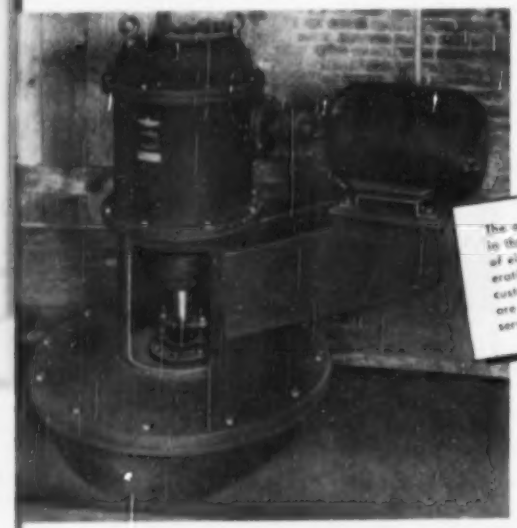

The agitator shown in the photo is one of eight now in operation . . . and the customer tells us all are giving excellent service.

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NETTCO *Engineered* AGITATORS

tiquated chemical terms are defined as a help to reading the older literature. The introduction, a short refresher course in the peculiarities of German grammar, is a guide to the use of the book.—*FA*

RECENT BOOKS & PAMPHLETS

Copper. "Government Administration of the Copper Industry, World War II." Study of the formation and development of the War Production Board with specific relation to copper and its products. By John W. Douglas. 51 pages. $1. John W. Douglas, Republic Foil & Metal Mills Inc., 55 Triangle St., Danbury, Conn.

Foods. "Composition of Foods, Raw, Processed, Prepared." Complete detail on chemical composition and special nutrients of many types of foods. Three tables of data deal with the edible portion of the food, the crude food as commonly purchased, and with the food as commonly used in the household. In all cases data are given for calcium, phosphorous, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid, as well as any other major components. By B. K. Watt and A. L. Merrill. 147 pages. Gratis. Agricultural Handbook 8, U. S. Dept. of Agriculture, Washington, D. C.

Safety. "Procedures for Evaluating Research Personnel With a Performance Record of Critical Incidents." 42 pages. American Institute for Research, Pittsburgh, Pa.

Chemical Engineering Reports. Material on the literature of chemistry and chemical engineering and its assembly into a report, either as a formal engineering or laboratory report. By Kenneth A. Kobe. 69 pages. $1. 3rd edition. Hemphill's Bookstore, Austin, Tex.

Safety. "Chemical-Engineering Conferences—14th Annual Meeting." Six papers on: atomic oxygen at silica surfaces, materials of construction for exhaust systems, sampling for stack gases, engineering the plant for people, safe use of solvents, effects of vibrating tools on workers. 54 pages. $1. Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 12, Pa.

Standards. "Index to ASTM Standards, December 1949." Subject index and list of titles in numeric sequence of all ASTM serial designations. 254 pages. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Apples. "Apples and Apple Products." Chemical composition, biochemical and physiological behavior, botanical aspects, and production factors for food processors and nutritionists, methods of utilization and processing. 486 pages. $7.80. Interscience Publishers, 215 Fourth Ave., New York 3, N. Y.

Glass. "ASTM Standards on Glass and Glass Products." Compilation of 18 standard and tentative methods of test and specifications. 116 pages. $1.50. 2nd edition. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Benzene. "Benzole and Toluene From Coal Gas." Picture of the benzene and larger carbonizing plants in Great Britain during the years between 1941 and 1945. Includes 23 large, fold-out data tables. 97 pages. 5s.6d. H. M. Stationery Office, York House, Kingsway, London, W.C.2, England.

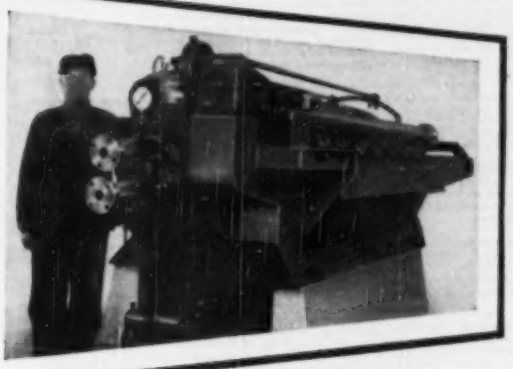
Plastics. "Plastics Research and Technology at the National Bureau of Standards." Review and bibliography. Brief outline of work carried on in each of eight different fields of investigation. Concludes with 160 references to publications by members of the staff of this bureau. 15 cents. National Bureau of Standards Circular 494, Superintendent of Documents, Washington 25, D. C.

—*End*

OLIVER PRECOAT FILTER

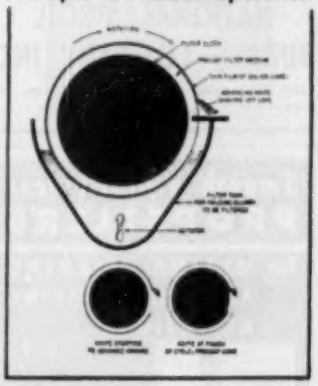
(Lead Protected)

Solves an Unusual Filtration Problem!



- The operator is a manufacturer of automobile bumpers.
- The solution handled is a sulphuric acid "brightener" bath following the nickel plating operation in an automatic plating system.
- The problem was to remove continuously the solids formed by chemical reaction during this "brightening" operation, solids difficult to filter because they tend quickly to blind a cloth. These solids, if permitted to remain, would result in faulty finishing which in time would cause pitting and rusting.

Principle of Precoat Operation



Here's how the Oliver Precoat Filter handles this situation: as the drum, precoated with about 2 inches of diatomaceous earth, revolves in the vat a thin film of solids is deposited on the surface. This film is carried around to the discharge point where it is shaved off by a knife edge traveling in toward the drum at a very slow rate. The cleaned surface of precoat enters the tank for further cake deposition. The key to the success of this operation is that the film is removed continuously and not allowed to build up to a point where it slows down filtration. The precoat layer lasts several days. It takes about two hours to replace the precoat.

At this plant, the Oliver Precoat Filter is keeping the solids content down to 0.062% which is well within safe limits.

Here is an excellent example of the *value* of the wide selectivity in filter types provided by the Oliver United line. There are many other types, each with its special advantage. But for this problem, the Precoat proved best.

With many filter types available plus more than forty years of filtration experience, wouldn't it be logical to bring *your* filtration problem to Oliver United?

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NEW TECHNICAL LITERATURE

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Air Compressors 252A	Two lines, one designed for industrial pressures of 100–125 lb.; the other rated at 200 lb. for continuous service, and up to 250 lb. on intermittent pump-up service. Both lines available as tank-mounted, base-plate-mounted or bare units, with electric-motor or gasoline-engine drive. Units are air cooled by means of fan blades integrally cast on the flywheel. Photographs show models and sizes; cross-sectional views, engineering data, sizes, dimensions. 8 pages.	Ingersoll-Rand Co.
Drawings 252D	Photographic materials and methods for improving legibility of reproduced engineering drawings and business documents. How to reproduce tracings, blueprints and opaque drawings on paper, film and cloth, and to restore old drawings and eliminate hand tracing. 16 pages.	Eastman Kodak Co.
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Instruments 252E	Measuring elements, operating principles, recording charts and accessories for various types of recording gages. Includes data on instruments for automatic controlling and telemetering of pressure and vacuum values. Photographs, reproduction of actual chart records, sketches of applications. 32 pages.	Bristol Co.
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pH Electrodes 252I	Lists industrial and laboratory types of electrodes. Illustrated, double-page spread shows each assembly and all of its components in tabular form. Accessories and supplies, such as buffer solutions, chemicals, holders and mountings are listed. 28 pages.	Leeds & Northrup Co.
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Instruments 252L	Variable area flow rate meter which can be adapted to many diverse requirements. Three types made up using the same fundamental parts. Available with flanged or screwed fittings, vertical or horizontal connections. Photographs show variations in construction. 24 pages.	Fischer and Porter Co.
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Materials Handling 252N	Two bulletins. The first is on a vibrating feeder employing mechanical means of operation. 4 pages. The other describes a vibrating conveyor which produces balanced mechanical operation without counterweights. Photographs, operation, applications and sizes. 4 pages.	Hewitt-Robins, Inc.
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Chemicals 252T	Di-tert-butyl-para-cresol, a crystalline, tri-alkylated phenol which is insoluble in water and aqueous alkali of any strength. Physical and chemical properties, uses, chemicals reaction. 13 pages.	Koppers Co.

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Resin 253B	Tetrafluoroethylene resin, known as Teflon, characterized by extreme inertness to chemicals, heat-resistance. Guide to its application in gaskets and packings; correlates properties with design considerations for various applications. 16 pages.	E. I. du Pont de Nemours & Co.
Heat Exchangers 253C	Standard line of exchangers is illustrated. Discusses construction details and process application to the petroleum, chemical, petrochemical and process industries. Includes flowsheets of various processes. 20 pages.	Patterson Foundry and Machine Co.
Silicones 253D	Lists silicone products giving properties and applications of each. 4 pages.	Dow Corning Corp.
Amines 253E	Charts give properties of aromatic amines, including distillation range, heat loss, ash, principal impurities, solubilities. Typical reactions. 8 pages.	B. F. Goodrich Chemical Co.
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Organolithium Compounds 253J	Supplement No. 1 to the company's "Annotated Bibliography on the Use of Organolithium Compounds in Organic Synthesis." Contains abstracts of papers published in 1948-49 and those published before 1948 which were overlooked in the original volume. 60 pages.	Metalloy Corp.
Equipment 253K	Photographs of a line of equipment including transmission and conveying machinery, vibrating feeders, conveyors and screens, magnetic separators, pulverizers, crushers. 48 pages.	Jeffrey Mfg. Co.
Centrifuges 253L	Illustrates with photographs and flow diagrams both tubular bowl and disc type centrifuges, together with the horizontal bowl desander type and crystal dehydrator. 4 pages.	Sharples Corp.
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Strainer 253N	Automatic self-cleaning strainer. Flow tables at various pressure drops, photographs of strainer during manufacture and fully assembled. 8 pages.	S. P. Kinney Engineers, Inc.
Corrosion Resistance 253P	Use of electrical tape to protect pipelines against corrosion by water, salt water, acids, alkalies and soils. Tape has black polyvinyl chloride backing, is 10 mils thick. Series of photographs show how it is applied. 4 pages.	Minnesota Mining and Mfg. Co.
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Thermometers 253R	Specifications for five different types of indicating and recording thermometers as well as for bulbs and fittings.	Electric Auto-Lite Co.
Instruments 253S	Liquid level indicators and auxiliary attachments for remote indication of liquid level in boilers, feed water heaters, storage tanks. Construction and operation, installation suggestions, dimensions, application diagrams, pictures of typical installations. 20 pages.	Yarnall-Waring Co.
Oklahoma 253T	With maps, tables and photographs, outlines Oklahoma's industries and natural resources. Figures are given on the value of leading minerals, crop production. 48 pages.	Oklahoma Planning and Resources Board
Instruments 253U	How to operate and apply viscosity meter. Cutaway drawing shows construction details. Pocket-sized folder. 6 pages.	Brookfield Engineering Laboratories
Adhesives 253V	Table lists adhesives by number, the materials for which they are specifically recommended, method by which most effective bond is created. Cites recommended uses, method of application, color, drying time. 8 pages.	B. F. Goodrich Co.
Equipment 253W	Cutaway views of equipment for removal of water, oil and pipe scale from compressed air systems such as aftercoolers, separators, stone air filters. Price and dimension tables. 8 pages.	R. P. Adams Co.
Pumps 253X	Series of sketches shows principle of operation of sanitary pumps for thin or viscous liquids and semi-solids at high or low temperature under pressure or vacuum. Cutaway photographs show pump assembled and disassembled. 4 pages.	Waterous Co.
Chemicals 253Y	Properties and suggested applications for a line of surface active agents and organic chemical specialties. Among them are high molecular weight tertiary amines and nonionic surface active fatty acid esters of higher polyglycols. 8 pages.	Alrose Chemical Co.
Wire Rope 253Z	Tabulates sizes and construction classifications of steel wire rope. Illustrations show various rope constructions. 4 pages.	Macwhyte Co.

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Acetic Acid — Vinegar
Calcium hydroxide
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*Article in C. & E. News Vol. 27 — 239

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New Technical Literature, cont. . .

Instruments 254A	Unit for testing ultrasonic energy. Photographs, specifications, cutaway drawing. 4 pages.	Brush Development Co.
Alloy 254B	Virgin aluminum alloy containing 6.5-7.5 percent magnesium with small amounts of other alloying elements. Physical properties, machinability, corrosion resistance, test data. 12 pages.	William F. Jobbins, Inc.
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Metal Stripping 254D	Procedure for use of a product for stripping nickel plate from copper and copper alloys. 5 pages.	Enthone, Inc.
Research 254E	Discussion of the function of the chemical consultant in today's industrial research. Illustrates facilities and equipment. 20 pages.	Foster D. Snell, Inc.
Chemicals 254F	Dimethyl chloroacetal, a bifunctional reagent. Properties, chart giving representative reactions. Information on purification, stability and directions for use. 6 pages.	General Aniline & Film Corp.
Drives 254G	Lists and illustrates three basic types of worm gear drives, each available in 10 sizes, for fractional or large horsepower, in speed ratios of 3½ to 1 up to 8,000 to 1. Typical drive problems with their solutions. 80 pages.	Link-Belt Co.
Pumps 254H	Photographs illustrate parts and operation of pump with no stuffing boxes, gaskets or valves. Performance curves, materials data. 4 pages.	Vanton Pump Corp.
Chemicals 254I	Data on applications and physical properties of more than 250 synthetic organic chemicals in tabular form. 16 pages.	Union Carbide and Carbon Corp.
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Welding 254L	Photograph, with parts labeled, shows unit for shielded arc welding. Some welds are shown; procedure is described. 6 pages.	Lincoln Electric Co.
Motors 254M	Variable speed motors. Illustrations show seven modifications of design, including three-phase and single phase, combination geared drives and types with flanged bracket for direct connection to the driven machine. 4 pages.	U. S. Electrical Motors, Inc.
Nozzles 254N	Specifications and photographs showing use of nozzle, which shears a continuous spiral sheet from a single jet. Covers industrial and fire nozzle. 2 pages.	Beto Fog Nozzle, Inc.

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OPERATION	SOFTENING	SOFTENING	SCHT. COLOR & TURB. REM.	COLOR REM.	ALGAE & COLOR REM.
NO. AND SIZE OF UNITS	2-35' DIA.	1-31' DIA.	1-45' DIA.	2-80' DIA.	1-50' DIA.
CAP. PER UNIT, M.G.D.	1.5	1.0	3.1	10.0	3.0
GAL./SQ. FT./MIN.	1.08	.93	1.35	1.34	1.07
AVG. TURB. EFF., PPM	LESS THAN 0.2	5.0	2.4 to 4.7	3 to 5	4 to 7
SLUDGE—% SOLIDS	35 to 46.5	24.9 to 39.2	16.7	—	—

Here are the reasons for this performance...

Uniform Feed Distribution . . . feed is distributed within the sludge blanket by means of rotating arms which constantly agitate the blanket.

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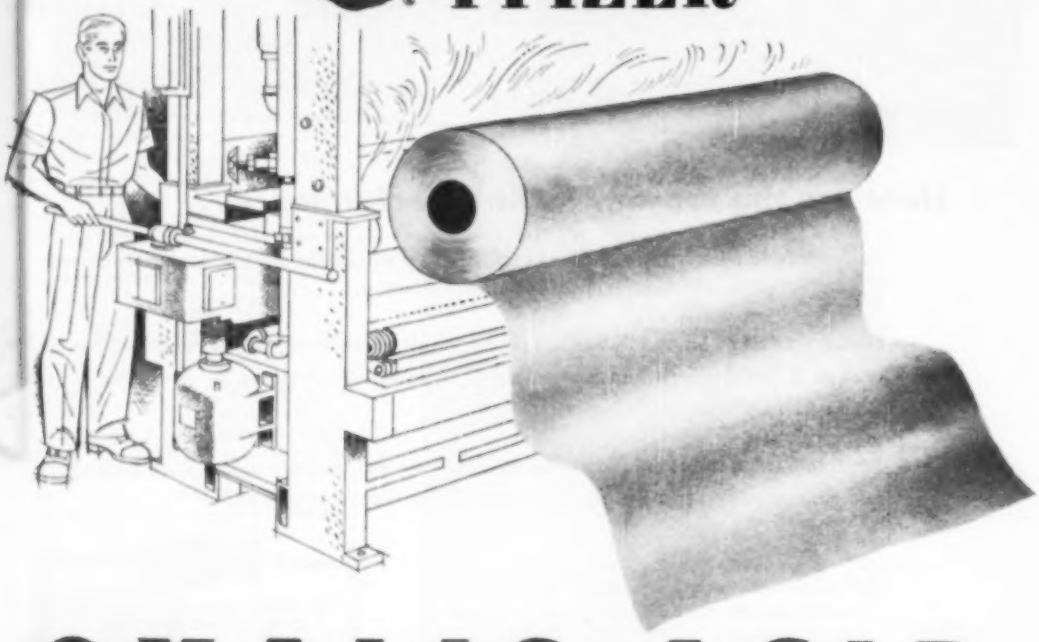

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Chemical Economics

RICHARD F. WARREN, Market Editor

Rubber Program Growth Cuts Into Expansion of CPI Output

A few months ago most chemical executives were worried. They were trying to find markets for the expanded productive facilities that were built up during and after World War II. Problems involving bottlenecks in raw material supplies had faded out of the picture in 1949. In May, a period of prosperity based on what was considered a normal "cold war" economy had pushed chemical consumption to an all-time high. Then came the Red invasion of Korea.

This caused a falling off of strategic rubber reserves at a time when the Kremlin's stooges in Southeast Asia began to dance another Soviet jig. Remembering the problems created by the rubber famine in the early days of the last war our standby synthetic rubber plants are being brought out of mothballs. We want to make certain that our rubber supply is assured.

Supply & Demand

- Up- up- up go prices. Chemical Engineering's Chemical price index jumped more than 4 points last month —over the post-OPA peak.
- All alkali producers are working again. This should ease the resale market prices down to reasonable levels.
- Solvents and pigments are short. Voluntary allocations are being made by producers.
- Benzene expansions are being studied by the government to relieve the long term shortage.
- High inventory turn-over plus raw material shortages have created some unbalancing of stocks.

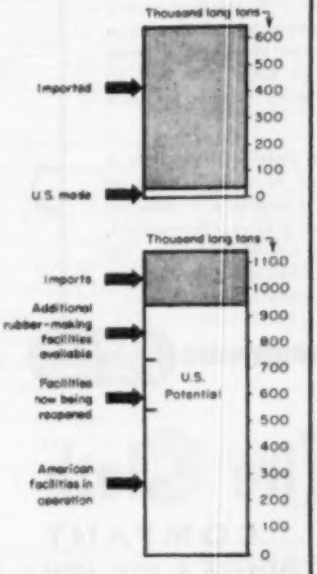
One of the first chemicals to feel the pinch was benzene. Benzene has been a potential weak spot in chemical expansion plans for years. (See *Chemical Engineering*, p. 313, Jan. 1948) but the shock of a war and the increase in demand for plastics and synthetic rubber stretched supplies close to the breaking point. In the spring benzene from petroleum began to move to customers. The price was close to 40c. per gal. in the southwest. At that time coke byproduct benzene was selling in Texas for 25c. per gal. Today this benzene is up to 30c. per gal. (fob. works) in tank cars and tank truck prices in the New York area are about 39c. per gal. Imported benzene is even more expensive.

With the reopening of all of our rubber facilities creating a shortage of styrene (made from benzene), the possibility of using more butadiene in GR-S is being pushed. This means that all the butadiene plants including those using the high-cost alcohol process will be reactivated. These plants use tremendous quantities of ethyl alcohol. Next year consumption of ethyl in synthetic rubber may reach more than 100,000,000 gal.—a very sizable part of our industrial alcohol production. The new demand will create a real shortage of this material when the units get into operation. Initial requirements for the Kobuta and Louisville alcohol-butadiene operations are estimated at from 32 to 34 million gallons of ethyl alcohol. Since cost does not appear to bother the governments expansion plans this amount will probably grow fast. Peak use of alcohol in rubber came in 1945 when 316 million gallons were used.

Synthetic Rubber Is King

In 1940 consumption of rubber in this country reached 650,000 long tons. Only 3 percent of this total was synthetic. Our synthetic capacity at that time amounted to 4,500 long tons. Most of our supplies came from the Far East.

In 1950 we are consuming rubber at a rate of more than 1,100,000 long tons. However, we have a synthetic capacity 940,000 long tons per year. All of it will be running in 1951. This year we will use about 655,000 long tons of natural rubber. Next year we will need 200,000 long tons of natural to fill the gap at current consumption rates.



New Rubber Consumption
(1,000 tons)

	Natural	Synthetic
1941	775	6
1942	277	15
1943	318	171
1944	144	567
1945	106	693
1946	277	762
1947	563	559
1948	607	442
1949	474	414
1950 first 8 mo.	485	326
last 4 mo.*	170	200

* Data compiled by U. S. Rubber Co. Last four months estimated.

The accompanying chart shows the relative position of our rubber supply situation in 1940 and 1950. It can be seen that while our consumption has almost doubled in ten years, our dependence on natural rubber has dropped considerably. This transition

(Continued)

ARE YOU USING THE *Right* METALLIC FILTER CLOTH for *Your* FILTRATION

If you are in doubt or would like to try another style weave, write us in detail about your filtration step. We make all five of the standard weaves mentioned above. We are in position to turn out special weaves, if necessary. And we make cloth from all malleable metals, including the noble metals.

All Newark Metallic Filter Cloth is manufactured in a wide range of meshes. It is available in rolls, cut and gasketed to fit your filter presses, or made up into filter elements. We have large stocks of standard weaves on hand to make prompt shipment.

NEWARK for ACCURACY

Newark Wire Cloth COMPANY

351 VERONA AVENUE • NEWARK 4, NEW JERSEY

is further illustrated by the following figures showing natural and synthetic rubber consumed annually in this country since the beginning of the last war.

Metals are taking larger quantities of chemicals than they ever consumed in past years. Reason: The tremendous growth in the steel output plus a resurgence in aluminum and magnesium production. Steel production this year should top any previous year's supply by more than 5 million tons. Aluminum output will probably hit 1.4 billion pounds. Previous peacetime record was 1.25 billion pounds. Its all-time high was more than 1.8 billion pounds. A hitch in the production plans may occur if chemical shortages hold up schedules.

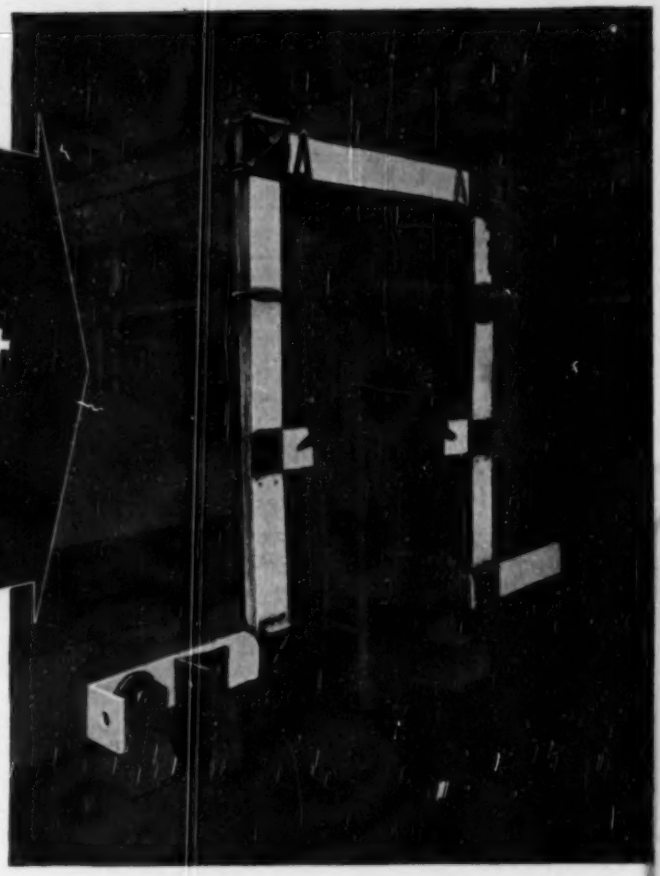
Inflationary price movements continued in September. About the same number of price increases were reported. Few prices have avoided the creeps during the June-September period. However, some fats and oil prices fell off during the month as a result of the good war news.

Here are a few of the important items up in September: Alcohol, acetone, alkalis, aluminum, benzene and other coal tar products, dyestuffs, glycerine, lead salts, mercury, soap, and zinc salts. For a list of hard to get items, just check the above. Chemical Engineering's price index reflected these hikes by jumping up more than 4 points to 111.99. Across the board wage hikes seem to be following a general pattern and the price usually reflects such advances in cost immediately.

Outside spot market sales of some chemicals are reported at premium prices far above the contract prices used in computing the price index. For example: caustic soda in the resale market was being purchased at 12¢ per lb. in September. The contract price of caustic soda is only 3.35¢ per lb.

Industrial inventories in September confirmed the downward trend reported in August. Turnover rates have been steadily on the increase for the past three months, with many now reaching an all-time high. NPA Inventory Limitation Order #1 is not expected to have much effect on the over-all industrial inventory picture. Most of the materials covered by the order have been critically short, and despite the high rate of turnover developed, some inventories are unbalanced.

HIGH efficiency at LOW voltage



Revere Copper is the ideal commercial metal where low voltage D.C. must be conducted at high efficiency.

• Type S, the large Hooker Electrolytic Caustic-Chlorine Cells, operate 24 hours a day 365 days a year at very high current efficiency under average operating conditions.

In the plant of the Hooker Electrochemical Company, at Niagara Falls, N. Y., the current for these cells enters as high voltage A.C. and is converted to low voltage D.C. in mercury arc rectifiers. Revere Copper Bus Bar carries the D.C. current from the mercury arc rectifiers to the Caustic Chlorine Cells. In these high voltage circuits efficiency is promoted by the ability of electrolytic copper to conduct current with the lowest losses possible for any commercial metal. Copper also is the best dissipator of the heat which accompanies high voltage A.C. conduction.

Current of 10,000 amperes from the rectifiers produces a voltage drop of 3.75 per cell. Here any increase in the resistance of the material of which the bus bars are made must result in a corresponding decrease of the efficiency of the circuit.

That is why Revere Electrolytic Copper Bus Bars are used. They have low resistance and high efficiency.

When an anode is to be renewed the cell is short circuited by means of a portable jumper which consists of copper connections and a switch, thus flowing the entire current around the cell and avoiding interruptions of the circuit.

This is an example of the all around handiness of Revere Copper for handling electricity. Copper has ideal mechanical strengths or "physicals" for clamping or bolting, and the best surface for high efficiency connections.

For low voltage or high, make your next installation with Revere Copper Bus Bar. You will get more results from your power dollar.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

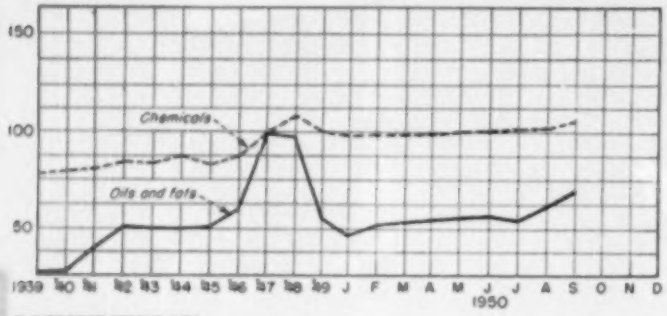
230 Park Avenue, New York 17, N. Y.

* * *

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

PRICES

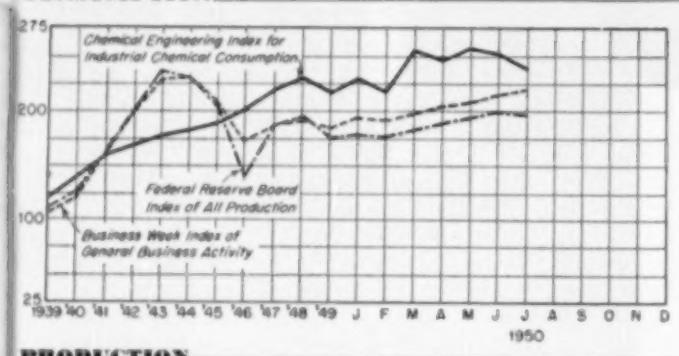


Chemical Engineering's Price Index a month, a year, and two years ago

	Chemicals	Oils & Fats
As of October 1	111.99	71.01
Last Month	107.85	71.46
October 1949	100.42	48.97
October 1948	110.49	85.74

1947 = 100

CONSUMPTION


275
200
100
25
Chemical Engineering Index for Industrial Chemical Consumption
Federal Reserve Board Index of All Production
Business Week Index of General Business Activity
1939 40 41 42 43 44 45 46 47 48 49 J F M A M J J A S O N D
1950

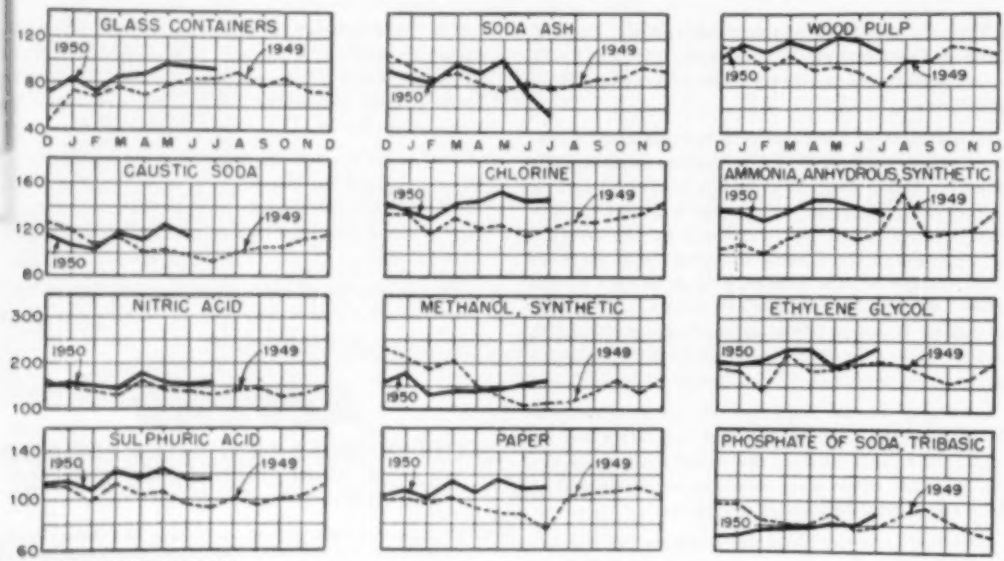
Chemical Engineering's Consumption Index for Industrial Chemicals

(A breakdown by consuming industries)

	June (Revised)	July
Fertilizers	50.25	42.50
Pulp and paper	26.70	25.50
Petroleum refining	22.05	23.59
Glass	21.42	21.01
Paint and varnish	30.20	27.50
Iron and steel	14.95	14.85
Rayon	30.19	29.55
Textiles	11.61	9.85
Coal Products	10.92	10.92
Leather	4.21	3.30
Explosives	8.42	8.03
Rubber	6.42	5.99
Plastics	15.62	15.20
INDEX	252.86	238.79

1935 = 100

PRODUCTION



100 = Monthly Average 1947

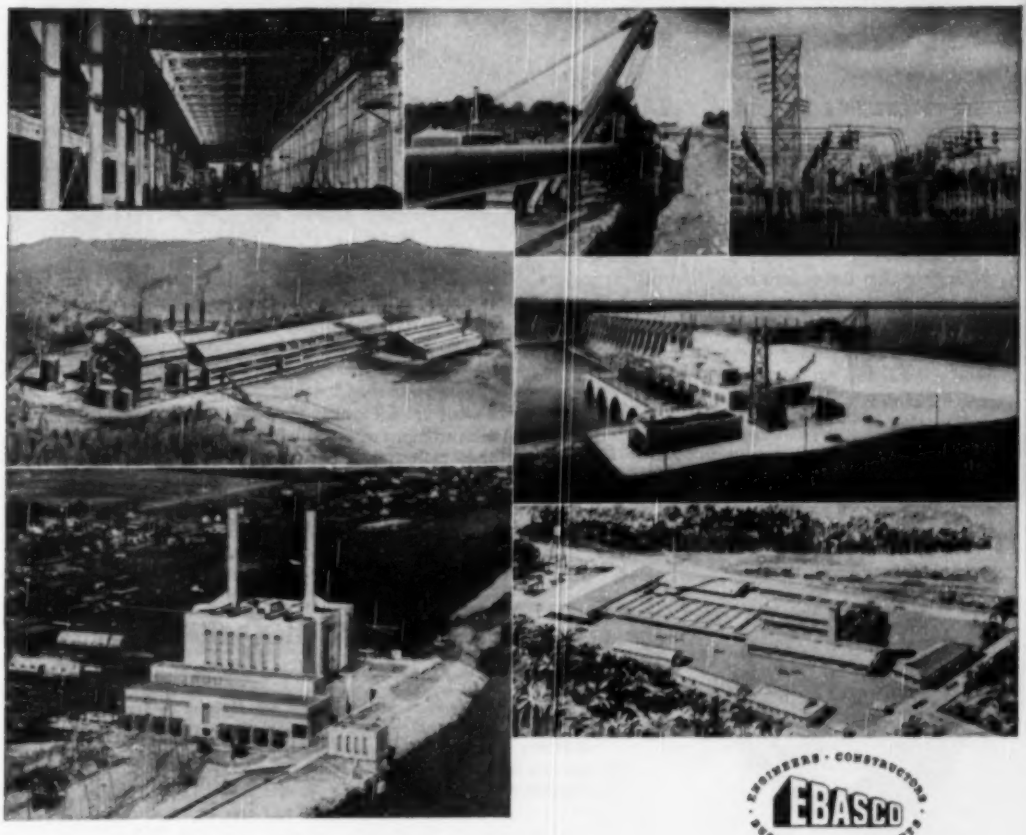
Panorama OF PROGRESS

A few examples of EBASCO's extensive, world-wide engineering and construction activities are pictured here. Industrial plants—steam electric stations—hydro electric projects—natural gas pipelines—each built quickly and efficiently with the aid of competent EBASCO teamwork.

Here is progress—the American way! These projects are a tribute to the initiative of business management in providing the modern facilities that give America the world's highest standard of living.

Now and for the future, wherever the need for such progress arises, EBASCO stands ready to do the job.

Send for the booklet *"The Inside Story of Outside Help."*
Address Ebasco Services Inc., Dept. J, Two Rector St., New York, N. Y.



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Appraisal	Design & Construction	Insurance & Pensions	Research
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Business Studies	Industrial Relations	Purchasing	Systems & Methods
Consulting Engineering	Inspection & Expediting	Rates & Pricing	Taxes
			Traffic

WHY maintenance men breathe easier...

DYNALOGS* have

No slidewire • No Balancing Motor • No Batteries to standardize

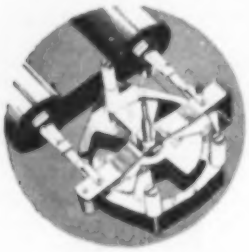
PRACTICALLY NO MAINTENANCE

With Dynalog Recorders and Controllers, maintenance men are freed from hazards of sticking electrical contacts and worn slidewires . . . freed from routine lubrication and cleaning of balancing motors, periodic standardizing and replacement of batteries. No wonder maintenance men breathe easier!

The simplicity of Dynalog design is one reason for its unequalled freedom from maintenance. In the entire balancing mechanism there are only four moving parts (none moving faster than the pen). It's free from the gears, cables, etc. used in conventional bridge-type instruments . . . the result of advanced engineering from concept to construction.

Freedom from maintenance is only one of many important advantages of Dynalog Instruments. They offer . . . *speed* that's full scale to new balance in as little as one second . . . *sensitivity*, one ten-thousandth of scale . . . *accuracy*, ¼ of 1% of scale. Available for measurement and control of temperature (with resistance bulbs or thermocouples), humidity, pressure, flow, force, pH, conductivity, etc. Get the complete story in Bulletin 427-1. Write **The Foxboro Company, 16 Neponset Ave., Foxboro, Mass., U.S.A.**

*Reg. U. S. Pat. Off.



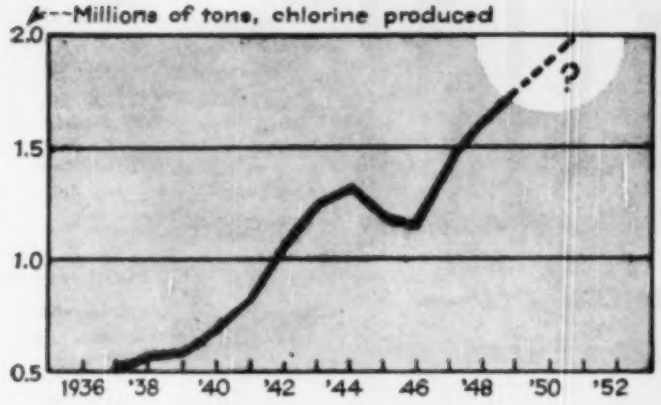
The heart of Dynalog superiority

It's a simple variable capacitor! Taking the place of the conventional slidewire, this important component gives Dynalog Instruments absolutely STEPLESS continuous balancing. It gives you an instrument of extreme accuracy and stability, with a sturdiness that withstands the most severe industrial conditions.

FOXBORO DYNALOG*

Reg. U. S. Pat. Off.

The electronic potentiometer that has NO SLIDEWIRE



Commodity Survey:

CHLORINE

One of our oldest commercial chemicals, it ranks fifth in annual output, and is climbing fast.

Like other chemicals that are made as byproducts or coproducts in a chemical process, chlorine is faced with a major supply-demand problem. Originally a salable byproduct of electrolytic caustic operations, the chlorine tail now wags the caustic dog. Production has grown steadily, but demand continues to run ahead of supplies. In recent months this shortage has been intensified by the strikes involving a big part of our output. Prior to the strike wave which started in June, production was running at an annual rate of 2,120,000 tons. In 1949 output reached 1,767,000 tons. Producers are erecting new capacities, but even the present expansion plans will not be sufficient to meet the needs of the chemical, pulp and paper, textile, and water treating industries. In May, chlorine output reached 107 percent of rated capacity. Even with planned expansions that will bring rated capacities close to 6,000 tons per day the industry will have to strain its facilities to meet essential needs.

About 90 percent of our domestic chlorine operations are carried out in alkali plants which produce sodium hydroxide as a coproduct. Approximately 10 percent is produced at sodium and magnesium operations. A minor percentage comes from caustic potash plants and a nitrosyl chloride unit.

In the caustic soda operations the raw material is brine (NaCl). This is purified, heated and pumped to an electrolytic cell. In the electrolysis, chlorine and hydrogen are liberated and drawn off. The remaining weak sodium hydroxide is pumped to separators and on to evaporators for processing to the desired grade. Chlorine from the cell passes through a cooler and into a drying tower. Here sulphuric acid runs countercurrent to the incoming gas. Dry gas is passed to a refrigeration unit where the chlorine is liquefied and loaded into cylinders.

Caustic potash operations are similar. However, the raw material used is KCl in place of the NaCl used in the other alkali plants and paper mills.

In the sodium and magnesium operations the metallic chloride is prepared in crystallized form, fused and broken down in an electrolytic cell the chlorine is drawn off and the molten metal is removed at the cathode and passed to a collector. The chlorine is cooled and treated as in caustic soda operations.

The background of the chlorine industry reflects the changing uses for this basic chemical. One of the early applications of chlorine was its use in preparing tin crystals needed in weighting silk. Another early use was in municipal water treatment. Niagara Falls, home of our early electrochemical industry, started the trend to chlorinating drinking water back in 1912. This use grew rapidly. In those years a number of pulp and paper mills also found it feasible to erect small units to satisfy some of their chemical needs.

Cheap power at Niagara Falls started the chemical on the road to its present powerful position in our national economy. In 1895 Mathieson Chemical Corp. (then Mathieson Alkali) started operations there. Pennsylvania Salt took advantage of the brine wells at Wyandotte, Mich., to start making chlorine in 1903. Hooker Electrochemical got under way at Niagara Falls in 1906.

In the year 1917-18, the war gas use appeared. By 1920 other end uses began to place a bigger demand on production facilities. Chlorine was widely used in bleaching powder production, output of dyes, chlorobenzene, sulphur chloride and carbon tetrachloride—first of a wide family of chlorinated organic solvents.

By 1930 the pulp and paper mills were using almost half of the nation's output. Chemicals were consuming almost a third of the production. Textiles consumed about a tenth, while water treatment use had dropped to about 15 percent of the total.

In 1937 chemical needs took more than 40 percent of the annual production. Chlorination of aliphatics was the major reason for the increase. By the end of World War II the chemical industry was using more than 75 percent of the fast growing output. Other bleaching methods had cut down the need for chlorine in the pulp and paper industries along with water treatment to about 16 percent of the total output. Textiles took most of the remainder. In recent years there has been a growing use of chlorine in metal processing and this market has a good future.

Where it is made

Firm	Location
Chlorox Chemical Co.	Oakland, Calif. Chicago, Ill. Jersey City, N. J.
Colorado Fuel & Iron Co.	Denver, Colo.
Diamond Alkali Co.	Edgewood, Md. Houston, Tex. Painesville, Ohio Pine Bluff, Ark.
Dow Chemical Co.	Freeport, Tex. Velasco, Tex. Midland, Mich. Pittsburg, Calif.
Du Pont de Nemours & Co., E. I.	Deepwater Point, N. J. Niagara Falls, N. Y.
Ethyl Corp.	Baton Rouge, La.
Fields Point Mfg. Corp.	Providence, R. I.
Frontier Chemical Co.	Seagraves, Tex.
General Electric Co.	Pittsfield, Mass.

(Continued)

ORTON

with GM *Dynaflow*— Drive

***NO SHOCK LOADING** on gears, shafts and clutches! Smooth fluid application of power from the engine to load! Stresses cut in half, maintenance and time out for servicing cut to less than half!*

***CUSHIONED SHOCK MEANS A LOT** — not only to machine but to operator! He has perfect control at all times—he can hover over a load, adjust a fraction of an inch without clutch or brake action! Cuts operator and equipment fatigue and wear!*

***THROTTLE CONTROL! POWER** to start a heavy load without "slip-clutching" at high speed— **POWER CONTROL** to pick up heavy loads smoothly and quickly!*

The GM *Dynaflow Drive* is a torque converter *combined* with a fluid clutch. The ORTON Crane with GM *Dynaflow Drive* AUTOMATICALLY PROVIDES THE CORRECT TORQUE in the *exact amount needed* to move the load!

ORTON
Crane and Shovel Co.
608 So. Dearborn Street
Chicago 5 • Illinois

COMMODITY SURVEY, *cont. . .*

Firm	Location
Goodrich Co., B. F.	Louisville, Ky.
Gulf Refining Co.	Port Arthur, Tex.
Hercules Powder Co.	Hopewell, Va.
Heyden Chemical Co.	Memphis, Tenn.
Hooker Electrochemical Co.	Niagara Falls, N. Y. Tacoma, Wash.
Innis-Speiden Co.	Niagara Falls, N. Y.
Mathieson Hydrocarbon Chemical Corp.	Saltville, Va.
Monsanto Chemical Co.	East St. Louis, Ill.
Morton Salt Co.	Manistee, Mich.
National Distillers Chemical Corp.	Ashtabula, Ohio
National Lead Co.	Sayreville, N. J.
Niagara Alkali Co.	Niagara Falls, N. Y.
Penn Salt Mfg. Co.	Tacoma, Wash. Portland, Ore. Wyandotte, Mich.
Pittsburgh Plate Glass Co.	Barberton, Ohio Natrium, W. Va.
Potash Co. of America	Carlsbad, N. M.
Rayo Chemical Co.	Los Angeles, Calif.
Solvay Process Co.	Baton Rouge, La. Hopewell, Va. Huntsville, Ala. Syracuse, N. Y.
Southern Alkali Corp.	Corpus Christi, Tex. Lake Charles, La.
Stauffer Chemical Co.	Las Vegas, Nev. Niagara Falls, N. Y.
Texas Carbon Industries	Sayre, Okla.
Westvaco Chemical Division, Food Machinery & Chemical Corp.	South Charleston, W. Va.
Wyandotte Chemicals Corp.	Wyandotte, Mich.
Zonite Corp.	New Brunswick, N. J.

PAPER MILLS

Bare Paper Co., D. M.	Roaring Springs, Pa.
Brown Co.	Berlin, N. H.
Castanea Paper Co.	Johnsonburgh, Pa.
Champion Paper & Fibre Co.	Canton, N. C. Hamilton, Ohio Houston, Tex.
Eastern Mfg. Co.	South Brewer, Me.
Ecusta Paper Co.	Pisgah Forest, N. C.
Kimberly-Clark Corp.	Kimberly, Wis.
Oxford Paper Co.	Rumford, Me.
Penobscot Chemical Co.	Great Works, Me.
Southern Advance Bag & Paper Co.	Hodge, La.
Warren & Co., S. D.	Cumberland, Me.
West Virginia Pulp & Paper Co.	Luke, Md. Mechanicsville, N. Y. Tyrone, Pa. Covington, Va.

—*End*

F-H Airslide conveyor collecting Portland cement from storage bins

Screw conveyor replaced by F-H Airslide

AIRSLIDE means "AIR-BORNE"

For sheer simplicity, low-maintenance costs and ease of operation, the F-H Airslide conveyor is just about tops! In this system, dry pulverized materials like cement, lime, gypsum, soda ash, flour or similar products are aerated or fluidized and made to flow like water. Air is dispersed through the material from a porous medium so that each particle is enveloped in air, thus reducing the inter-particle friction and the angle of repose. Hence the material flows.

Think what this means to you? Because the system is completely enclosed, danger of contamination is removed. Dusting is eliminated. The only power required is low-pressure air in small quantities. There are no repairs, replacements or costly down-time. Easily erected and definitely a space-saver, the F-H Airslide conveyor permits a flexibility of plant design not available with straight-line conveyors.

Why not let our engineers show you how the F-H Airslide can help cut your conveying costs . . . modernize your present plant equipment or plan an entirely new system. Chances are we can show you how a minimum expenditure can bring you a conveyor system that means low cost, reliable operation.

FULLER COMPANY, Catasauqua, Pa. • 120 S. LaSalle St., Chicago 3 • 420 Chancery Bldg., San Francisco 4

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS — FEEDERS AND ASSOCIATED EQUIPMENT

fuller

FH-14

NEW CONSTRUCTION

	Current Projects		Cumulative 1950	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	$2,000,000	.....	$4,100,000	$472,000
Middle Atlantic	1,500,000	$300,000	3,510,000	25,784,000
South	180,000	26,475,000	62,768,000	102,287,000
Middle West	1,000,000	4,328,000	11,426,000	48,920,000
West of Mississippi	4,850,000	35,120,000	97,200,000	105,183,000
Far West	.....	.....	21,286,000	8,755,000
Canada	.....	568,000	21,936,000	26,185,000
Total	$9,500,000	$66,791,000	$221,108,000	$377,586,000

Proposed Work

Conn., New London—Dow Chemical Co., Midland, Mich., has acquired a 78 acre site here and plans to construct a polystrene plant. Estimated cost will exceed $2,000,000.

Fla., Jacksonville—Lehigh Portland Cement Co., Lehigh, Pa., plans to construct a plant at East Jacksonville to bag cement which will be produced at its plant at Bunnell, Fla. Estimated cost will exceed $150,000.

Mich., Grand Rapids—American Box Board Co., 470 Market Ave., plans to construct a paper manufacturing plant. Estimated cost $1,000,000.

N. M., Farmington—Delhi Oil Corp., 1315 Pacific St., Dallas, Tex., plans to construct a gasoline refinery in this area. Estimated cost $1,750,000.

Okla., Ponca City—Cities Service Oil Co., Ponca City, plans to modernize and enlarge its refinery. Estimated cost $1,750,000.

Pa., Philadelphia—Paper Manufacturers Co., 5th and Willow Sts., plans to construct a factory and office building. Clarence L. Caspary, 1400 South Penn Sq., Archt. Estimated cost $1,500,000.

Tex., Dallas—Gates Rubber Co., 1710 North Market St., plans to triple the capacity of its rubber products plant in the Trinity industrial area. Estimated cost $300,000.

Tex., Fort McKavett—Humble Oil & Refining Co., 1216 Main St., Houston, plans to construct a crude oil pipe line pumping station near Marble Falls. Estimated cost $300,000.

Tex., Fort Worth—International Minerals & Chemical Corp., 20 North Wacker Dr., Chicago, Ill., plans to construct a chemical fertilizer plant here. Estimated cost $400,000.

Tex., Warda—Humble Oil & Refining Co., 1216 Main St. Houston, plans to construct a crude oil pipe line pumping station near Big Lake. Estimated cost $350,000.

Contracts Awarded

Ga., Atlanta—International Paper Co., c/o Miller-Davis Co., contractor, 1287 Portage St., Kalamazoo, Mich., will construct a factory and office building here. Estimated cost will exceed $100,000.

Ill., Chicago—Illinois Paint Co., 1034 South Kostner St., has awarded the contract for a paint factory to B-W Construction Co., 39 South LaSalle St. Estimated cost $360,000.

Ill., Chicago—Pure Carbonic Co., 1918 South Lomber St., has awarded the contract for a dry ice plant to Abell-Howe Co., 53 West Jackson St. Estimated cost $300,000.

Ind., East Chicago—Socony-Vacuum Oil Co., East Chicago, has awarded the contract for a Thermofor catalytic cracking unit at its refinery to C. F. Braun & Co., 630 Fifth Ave., New York, N. Y.

Ia., Charles City—Dr. Salsbur's Laboratories, Highway 15, have awarded the contract for the design and construction of a chemical processing plant to The Austin Co., 510 North Dearborn St., Chicago, Ill. Estimated cost $300,000.

Kan., Kansas City—Pure Carbonic Co., Div. of Air Reduction, Inc., 111 West 22nd Pl., Kansas City 8, Mo., has awarded the contract for a plant to J. F. Pritchard & Co., 908 Grand St., Kansas City. Estimated cost $1,000,000.

La., Blanchard—Arkansas-Louisiana Gas Co., Slattery Bldg., Shreveport, has awarded the contract for a 4,200 hp. compressor station to Delta Engineering Corp., 2121 San Felipe Rd., Houston. Estimated cost $375,000.

Miss., Hattiesburg—Hercules Powder Co., Wilmington, Del., has awarded the contract for a plant for the production of toxaphene, a chlorinated camphene insecticide, to H. K. Ferguson Co., 1783 East 11th St., Cleveland, O. Estimated cost $1,500,000.

N. C., Kinston—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., will construct a nylon plant on a 635 acre site between Kinston and Grainger. Work will be done by owners. Estimated cost $24,000,000.

Okla., Ponca City—Continental Oil Co., Ponca City, has awarded the contract for the design and construction of a laboratory building to Wigton-Abbott Corp., 1225 South Ave., Plainfield, N. J. Estimated cost $2,250,000.

Pa., Bristol—Carborundum Co., Niagara Falls, N. Y., has awarded the contract for a 1 story plant to Lauter Construction Co., 112 South 16th St., Philadelphia. Estimated cost $300,000.

Tenn., Old Hickory—E. I. du Pont de Nemours & Co., c/o Fred Wright Construction Co., Nashville, will construct an addition to its plant here. Estimated cost $500,000.

Tex., Coleman—Anzac Oil Corp., Coleman, will construct gas injection refinery unit with own forces. Estimated cost $675,000.

Tex., Eckert—Humble Oil & Refining Co., 1216 Main St., Houston, will construct a crude oil pipe line pumping station north of Fredericksburg. Work will be done with own forces. Estimated cost $375,000.

Tex., Electra—Basin Pipe Line Co., Midland, will construct a crude oil pumping station. Work will be done with own forces. Estimated cost $365,000.

Tex., Houston—Ethyl Corp., National Standard Bldg., has awarded contract to C. F. Braun & Co., 1000 South Fremont St., Alhambra, Calif., for tetra-ethyl lead chemical plant unit at $4,250,000; Ethylyn chloride chemical plant, at $3,750,000; sodium and chlorine chemical plant unit at $5,500,000; miscellaneous chemical plants at $6,500,000. Total cost $20,000,000.

Tex., Houston—Lubrizol Corp., Cleveland, O., and P. O. Box 3, Houston, has awarded the contract for a chemical factory to Brown & Root, Inc., P. O. Box 3, Houston. Estimated cost $850,000.

Tex., Marshall—Texas-Illinois Natural Gas Pipe Line Co., 20 North Wacker Dr., Chicago, Ill., has awarded the contract for design and construction of a pipe line natural gas booster station and 20 residential units also pipe line maintenance warehouse, near here, to Fish Pipeline Construction Co., M & M Bldg., Houston. Estimated cost $1,000,000 and $225,000 respectively.

Tex., Port Arthur—Gulf Oil Corp., Gulf Bldg., Houston, has awarded the contract for a fluid catalytic cracking unit at its refinery here to M. W. Kellogg Co., 225 Bway., New York, N. Y. Estimated cost $8,000,000.

Tex., Wichita Falls—Phillips Petroleum Co., Wichita Falls, will reconstruct portion of its refinery. Work will be done by purchase and hire. Estimated cost $80,000.

Wis., Appleton—Appleton Coated Paper Co., 1200 North Meade St., has awarded the contract for a warehouse to P. C. Miron Construction Co., Inc., 139 North Story St. Estimated cost $100,000.

Wis., Kaukauna—Thilmany Pulp & Paper Co., Kaukauna, has awarded the contract for a 4 story, 40x145 ft. turbine room to Permanent Construction Co., 4100 North 3rd St., Milwaukee.

Alta., Edmonton—Hobbs Glass, Ltd., 11925 Jasper Ave., has awarded the contract for a warehouse to C. H. Witham, Ltd., 10570 113th St., at $208,584.

Que., Montreal—Sherwin-Williams Co. of Canada, Ltd., 2875 Center St., has awarded the contract for plant extensions to Foundation Co. of Canada, Ltd., 1900 West Sherbrooke St. Estimated cost $100,000.

Que., St. Jerome—Dominion Rubber Co., Ltd., 550 Papineau Ave., Montreal, has awarded the contract for a warehouse to Ross & Anglin, Ltd., 4400 St. Catherine St., Montreal. Estimated cost $260,000.

When BETHLEHEM Builds 'Em

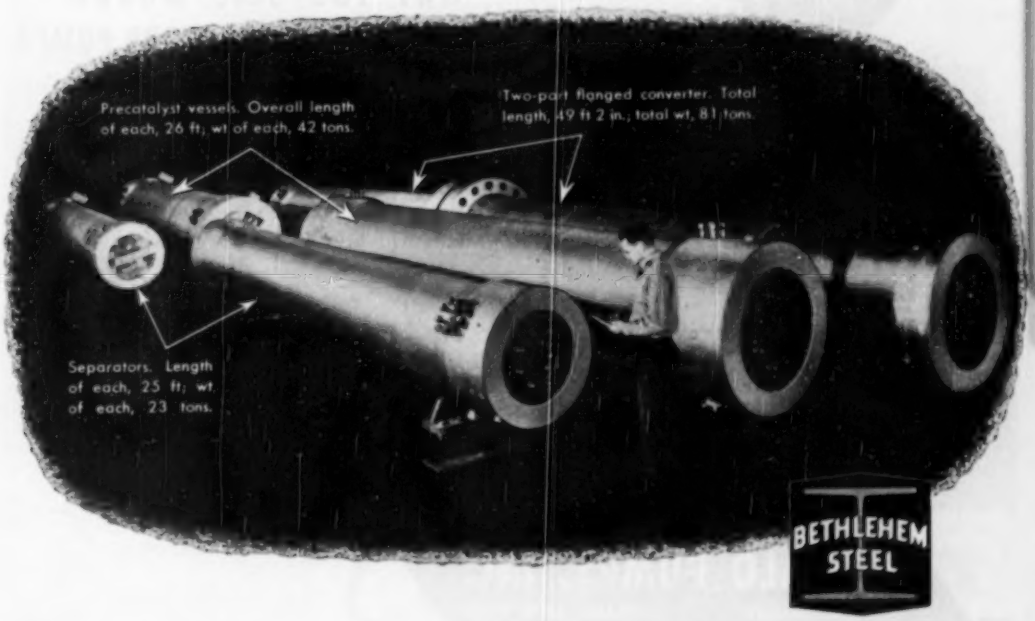
THEY'RE RIGHT!

Forged-steel pressure vessels have long been a specialty at Bethlehem, and only specialists of years' standing are assigned to the building of these units. As a result, the finished jobs leaving our shops are correct to the last small detail and fully meet all specifications.

An order placed with Bethlehem is your assurance of the proper steel, carbon or alloy; the proper forging, treating, machining, assembling, testing. And please don't forget, Bethlehem can do a skilled job on the lightweight units as well as the big fellows weighing many tons.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation


Precatalyst vessels. Overall length of each, 26 ft; wt of each, 42 tons.
Two-part flanged converter. Total length, 49 ft 2 in.; total wt, 81 tons.
Separators. Length of each, 25 ft; wt of each, 23 tons.
BETHLEHEM STEEL

Bethlehem FORGED-STEEL PRESSURE VESSELS

Accessible For Quick Inspection

ANOTHER REASON
WHY YOU SAVE MONEY
USING "BUFFALO" DS* STOCK PUMPS

Bearing Cover Also Readily Removable

Above, showing "Buffalo" Rubber-Lined "DS" Pump with bearing cover removed. Note rugged construction throughout.

"Buffalo" Diagonally Split-Shell* Paper Stock Pumps save many production hours and maintenance hours through this convenient feature. Upper half of pump casing can be removed without disturbing discharge piping, just by removing a few bolts. Paper mill men appreciate this in working with high-consistency stock. They also appreciate the rugged construction—the lasting efficiency—the non-clogging design of "Buffalo" DS Pumps.

WHY NOT WRITE FOR YOUR FREE COPY of Bulletin 953-G for all the facts on this and other proven "Buffalo" Pumps for every stock and every consistency?

BUFFALO PUMPS, INC.

501 BROADWAY BUFFALO, NEW YORK

Canada Pumps Ltd., Kitchener, Ont.

Corrosion Control Reports Give Interesting Data on

Carpenter Stainless No. 20

Dozens of engineers have written these progress reports on their successful use of Carpenter No. 20 to solve problems in handling many corrodents such as *sulphuric acid, sulphate salts, acetic, formic, phosphoric* and *maleic* acids, etc.

If your technical data file does not contain information on Carpenter Stainless No. 20, just write for copies of Field Summary Reports Nos. 1 through 4. Or, if you would like test coupons, let us know.

THE CARPENTER STEEL COMPANY, 127 W. Bern Street, Reading, Pa.

Export Department: Woolworth Bldg., New York 7, New York.—"CARSTEELCO"

Carpenter

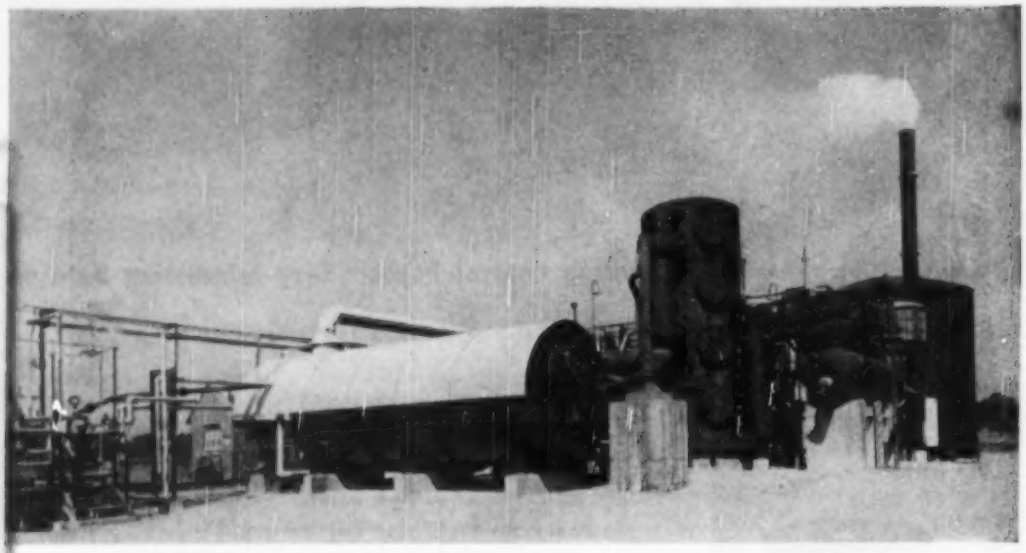
STAINLESS NO. 20

Licensed under patents of The Durion Co., Inc.

First New-Type

CHEMICO SULFURIC ACID PLANT

now in operation



The first plant, utilizing Chemico's new process for making sulfuric acid from sulfur, is now in successful operation at the Hamilton, Ohio works of the American Cyanamid Company. This new unit—rated at 50 tons per day can deliver sulfuric acid of any strength up to 95% H_2SO_4.

This new-type Chemico plant is basically simpler than conventional type contact sulfuric acid plants. The new process differs in these basic ways.

- It converts SO_2 to SO_3 in a highly efficient quench converter. This eliminates heat exchangers . . . assures higher yield from raw sulfur . . . virtually eliminates contamination due to unconverted SO_2.
- From the converter, the SO_2 gas mixture passes through a multiple dip-pipe absorption system, which operates by gravity flow. There is no need to distribute acid over packed absorbing towers.
- Water evaporation from absorber acid solutions removes heat of absorption and the sensible heat of hot gases. Only a small amount of cooling water is required for the product acid before storage.
- A built-in Pease-Anthony Venturi Scrubber insures mist elimination in the exhaust stack.
- Seven major items of equipment — usually found in present-type contact acid plants — have been eliminated: drying tower, gas filter, heat exchanger, SO_3 cooler, acid coolers, acid circulating and transfer pumps and diluting equipment.

THE RESULTS — The new-type plant is much smaller. It can be economically built and operated. Investment cost is lower per ton of capacity. Startup, shutdown and operation are easier.

CE 207

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, NEW YORK

EUROPEAN TECHNICAL REPRESENTATIVE

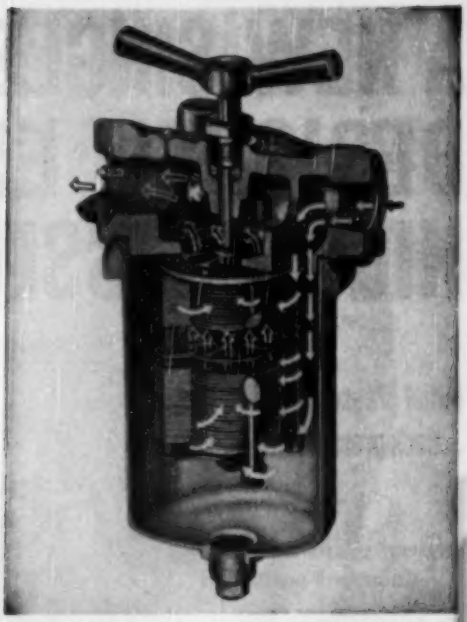
CYANAMID PRODUCTS, LTD., LONDON W.C.2, ENGLAND • CABLES: CHEMICONST, NEW YORK

Chemico plants are profitable investments

Cut FLUID-CLEANING costs 3 WAYS

with the only strainer that works uninterruptedly

1. ***Save loss of production due to strainer cleaning.***
2. ***Reduce maintenance cost on strainer.***
3. ***Eliminate strainer replacement cost.***



Cuno AUTO-KLEAN Strainer. Positive fluid protection, continuously—sizes handling from a few to more than 4000 gpm.

NON-STOP CLEANING—*Turning metal discs past cleaner blades (periodically by hand or continually by motor or other automatic means) "combs out" all solids—even when imbedded in strainer element—without interrupting flow.*

CUNO AUTO-KLEAN STRAINER is—for *most* process fluids—the most economical and efficient you can install.

UNLIKE ANY OTHER FLUID-CLEANING DEVICE, disc-type AUTO-KLEAN cleans fluid-continuously—with never an interruption to be cleaned itself, hence no loss of production, no contamination of product from exposure.

AN OCCASIONAL TURN OF A HANDLE—while in operation—combs out dirt accumulations . . . or this can be done automatically.

PERMANENT METAL CONSTRUCTION—in materials and spacings to suit specific fluids, viscosities, temperatures and solids—means low-cost straining for at least as long as the equipment on which it's installed.

For petroleum fluids, water, paints, general process fluids—install Cuno AUTO-KLEAN, guaranteed to remove *all* particles larger than specified.*

**Models available for straining from .0035 to .052 in., viscosities up to and above 300,000 SSU.*

No Fluid Is Better Than Its Filtration

CUNO

COMPLETE LINE

Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

MICRONIC • DISC-TYPE • WIRE-WOUND
MICRO-KLEAN • AUTO-KLEAN • FLO-KLEAN

Find Out How AUTO-KLEAN Can Cut Your Fluid-Cleaning Costs . . . Mail This Coupon

- ☐ Acids
- ☐ Air
- ☐ Alkali
- ☐ Boiler Feed
- ☐ Casein
- ☐ Cleaning Solutions
- ☐ Coatings
- ☐ Compressed Air
- ☐ Coolants
- ☐ Cutting Oils
- ☐ Dip Tank Systems
- ☐ Enamel
- ☐ Engine Fuel
- ☐ Engine Lubricating Oil
- ☐ Fuel Oil
- ☐ Fuel Tar
- ☐ Gases
- ☐ Gasoline
- ☐ Grease
- ☐ Grinder Coolant
- ☐ Hydraulic Oils
- ☐ Japan
- ☐ Lacquer
- ☐ Lubricating Oil
- ☐ Machine Tool Cutting Oil
- ☐ Machine Tool Hydraulic Oil
- ☐ Machine Tool Lubricating Oil
- ☐ Nitrocellulose Solutions
- ☐ Oils
- ☐ Paint
- ☐ Pyroxylin
- ☐ Quenching Oil
- ☐ Resins
- ☐ Rust Proofing Compounds
- ☐ Sizing
- ☐ Solvents
- ☐ Spray Systems
- ☐ Tar
- ☐ Test Stand Lubricating Oil
- ☐ Varnish
- ☐ Washing Compounds
- ☐ Water
- ☐ Wax

☐ OTHERS_____

CUNO ENGINEERING CORPORATION
103 South Vine Street, Meriden, Conn.

Please send me a free copy of your AUTO-KLEAN bulletin. I am especially interested in the services checked.

Name.....Title.....

Company.....

Address.....

City.....State.....

PLEASE ATTACH COUPON TO YOUR BUSINESS LETTERHEAD

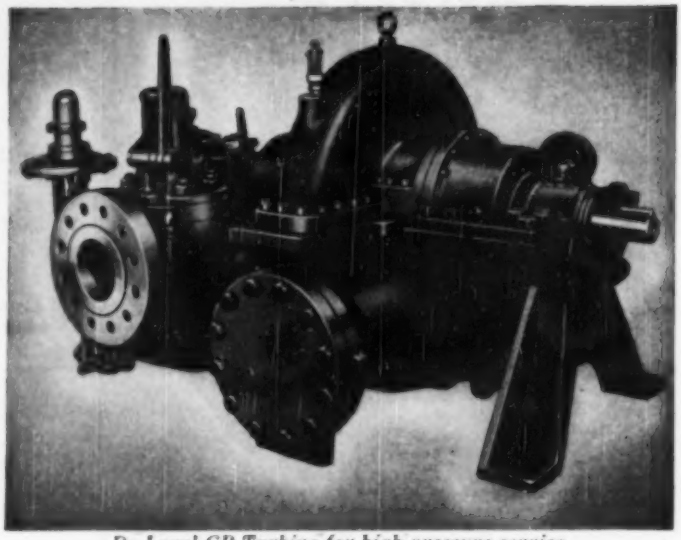
A NEW SINGLE-STAGE TURBINE DESIGNED ESPECIALLY FOR HIGH PRESSURES . . .

Initial pressures to 1450 psig .. Back pressures to 300 psig

THE FIRST SINGLE-STAGE TURBINE WITH ALL-LABYRINTH SHAFT SEALING

This new, high pressure single-stage turbine is more than an ordinary single-stage turbine in a "beefed up" high pressure casing. It is the *first* single-stage, mechanical drive turbine with all labyrinth shaft seals of the type generally used in large, multi-stage turbines especially designed for high pressure service.

Steam leakage along the shaft is effectively prevented by a labyrinth seal consisting of a series of shaft grooves and mating tongues of stainless steel—as many as 52 labyrinths per side being employed for the highest pressures. The labyrinth seal reduces losses, lasts longer and require less maintenance than carbon rings subject to wear.



De Laval CP Turbine for high pressure service.

When you buy a De Laval CP Turbine you also get...

True center-line support—to provide for thermal expansion without disturbing shaft alignment.

Choice of eight governing systems—to meet every control requirement.

Independent, positive over-speed trip entirely independent of the governing system for positive protection.

Horizontally split casing with steam chest in bottom half. The cover can be lifted without disturbing piping connections.

The De Laval CP Turbine is made in three sizes for capacities up to 2000 hp. For further information write for Bulletin 4215-33-CE.

DE LAVAL

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

T-33A

For Quiet Engine and Compressor Operation

Install BURGESS-MANNING SNUBBERS

To reduce engine exhaust and compressor intake noises, Burgess-Manning Snubbers are the answer. Turbulent slugs of hot exhaust gas or incoming pulses of air are snubbed so that the oscillating flow of gas, which causes noise, is smoothed to a unidirectional flow without appreciable restriction. The flow of gas from the engine, or the flow of air into the engine or compressor becomes smooth and quiet.

For a solution of your noise or gas surging problems, consult Burgess-Manning engineers.

APPLICATIONS

- Drilling
- Oil well pumping
- Crude oil and product pipe lines
- Gas transmission
- Repressuring
- Recycling
- Refineries
- Gasoline plants

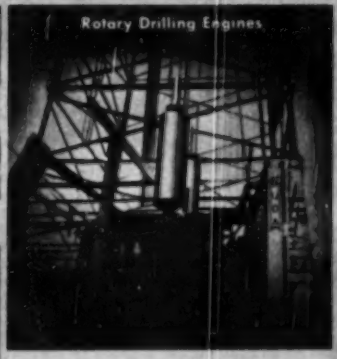
SDG Slug Buster Snubber

Burgess-Manning Snubbers on Fluid Catalytic Cracker

From the Producing Well, through the Refinery Gate . . . It's Burgess-Manning

Recycling Plant

Two Burgess-Manning Exhaust Snubbers outside recycling plant.

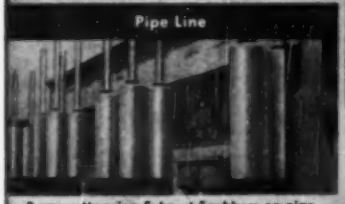


Rotary Drilling Engines

Burgess-Manning Snubbers on rotary drilling engines at Shawnee Drilling Co., Shawnee, Oklahoma.

Oil Pumping Station

Three Burgess-Manning Snubbers on engines at Shell Oil plant in California.

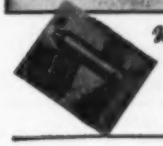


Pipe Line

Burgess-Manning Exhaust Snubbers on pipe line engines.

Portable Drilling Rig

Portable oil rig using Burgess-Manning Snubber.



Write for Bulletin

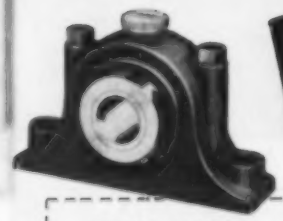
Bulletin No. 497 features Burgess-Manning's new SDG Slug Buster Snubber.

BURGESS-MANNING COMPANY

LIBERTYVILLE, ILLINOIS

FRICTION is the second biggest cause of industrial fires. 14% of such fires are started by hot bearings, misaligned or broken machine parts, jammed materials. (From study of 20,000 industrial fires by Associated Factory Mutual Fire Insurance Companies.)

ANTI-FRICTION, ANTI-FIRE!



DODGE-TIMKEN BEARINGS

America's quality-proved line. Write for complete data. Four basic types and a vast range of sizes to meet your needs.

As a fire hazard and a power stealer, friction is a menace to production.

Dodge-Timken Bearings, noted throughout the world for their high quality, carry power smoothly, efficiently, with no overheating to cause disastrous fires, no excessive wear to cause bearing failure and costly production break-downs.

On millions of industry's toughest jobs Dodge-Timken bearings save power, reduce maintenance costs and keep production rolling steadily. Available from Dodge distributors' stocks—mounted, sealed, housed, fully assembled ready to lock on the shaft.

Get the facts about the important "firsts" in the Dodge line of power transmission machinery, which includes Bearings, Sheaves, Clutches, Couplings and the new Dodge Torque-Arm Speed Reducer.

DODGE MANUFACTURING CORPORATION • 200 UNION ST., MISHAWAKA, INDIANA

Call a Transmissioneer. He's factory-trained to help solve your power-drive problems. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

DODGE

of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY

NAME PLATES

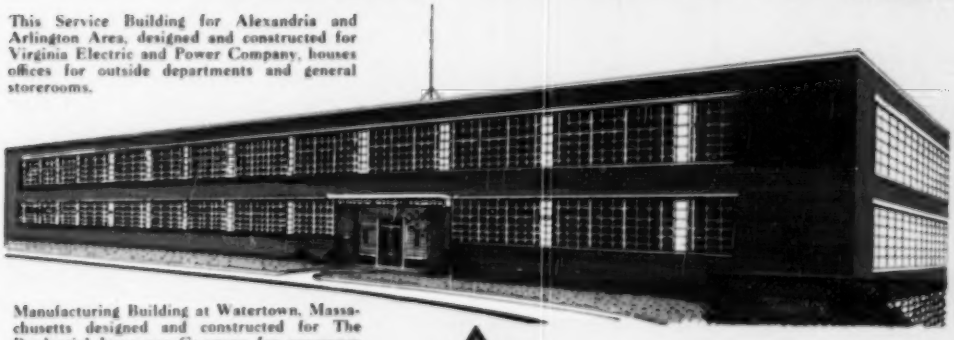
FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

SIZE IS NOT IMPORTANT

The Roaring River Hydroelectric Development designed and constructed for Jamaica Public Service Company Ltd., Jamaica, B.W.I. Water is diverted from springs at the source of Roaring River through a pipe line to a single unit turbogenerator plant where it is converted into 4,500 kva of electric power.

Our work includes engineering and construction for varying projects, large and small. Each receives the same technical skill and attention. Our broad experience is available to all branches of industry.

This Service Building for Alexandria and Arlington Area, designed and constructed for Virginia Electric and Power Company, houses offices for outside departments and general storerooms.



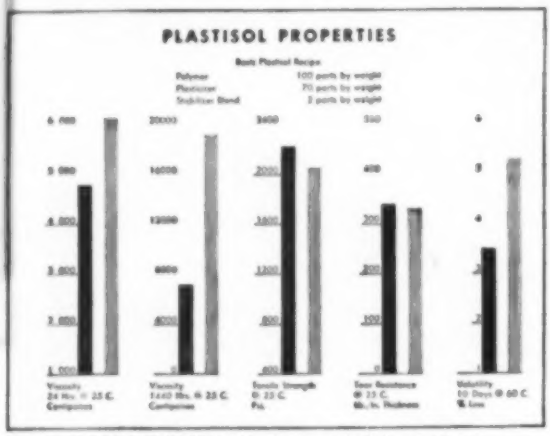
Manufacturing Building at Watertown, Massachusetts designed and constructed for The Prudential Insurance Company for occupancy by Manning, Maxwell & Moore, Inc. The total floor area is 136,000 sq. ft.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

HOW TO GET

IMPROVED QUALITY AND LOWER VISCOSITY PLASTISOLS WITH BARRETT* "ELASTEX" 10-P PLASTICIZER


PLASTISOL PROPERTIES
Base Plastisol Recipe
Polymer 100 parts by weight
Plasticizer 70 parts by weight
Stabilizer Blend 2 parts by weight

Key: Black—"ELASTEX" 10-P Plasticizer; Grey—di-2-ethylhexyl phthalate

In the manufacture of plastisols for coating and low-pressure molding operations, compounders have long known the value of di-2-ethylhexyl phthalate as a primary plasticizer. Dispersions of vinyl resins in this plasticizer possess good storage stability, and are of moderately low viscosity. The coatings and molded articles produced from them exhibit good physical and performance characteristics.

Now Barrett offers the plastisol compounder an even more efficient dispersant—"ELASTEX" 10-P Plasticizer.

Plastisols prepared with this high quality primary plasticizer possess lower viscosity and better storage stability than do those compounded with equivalent amounts of di-2-ethylhexyl phthalate. At the same time, the fused products exhibit improved physical properties, and are subject to less volatile loss.

If you manufacture plastisols for spread coating, molding, or casting, the superior performance of Barrett "ELASTEX" 10-P Plasticizer is well worth investigating.

✓ **NOTE:** Technical advice on the use of BARRETT Chemicals is available to you through the assistance of Barrett representatives. Why not put your problem up to us? Phone, wire or write

BARRETT* CHEMICALS AVAILABLE TO THE PLASTICS INDUSTRY

"ELASTEX" 10-P Plasticizer	Dibutyl Phthalate
"ELASTEX" 28-P Plasticizer	Phthalic Anhydride
"ELASTEX" 50-B* Plasticizer	Phenol
"ELASTEX" DCHP Plasticizer	Crystal Urea

Barrett

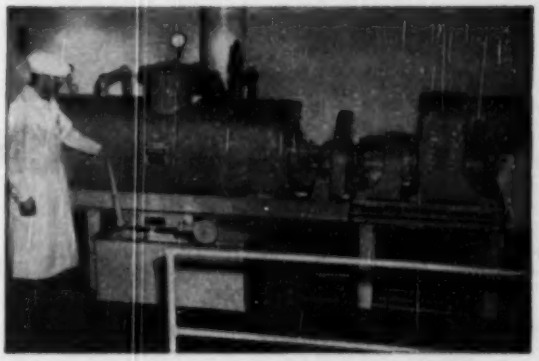
THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd.
9351 St. Hubert Street, Montreal, Que.

*Reg. U. S. Pat. Off.

FP 9-5-50 V-J

P.O. 1705 Ad 250A

VACCUM DRYING improves processes... develops new products... cuts costs!

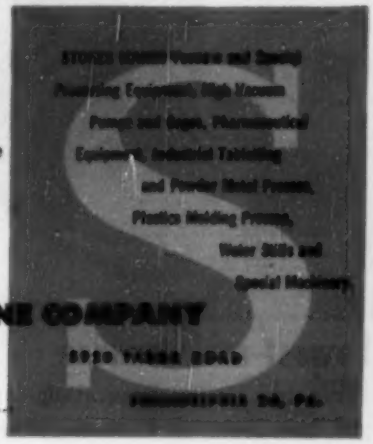


At John Morrell & Co., Ottumwa, Iowa plant, a Stokes Rotary Vacuum Dryer has been installed for extensive test runs . . . to improve processes, cut costs, and develop new products.

Designed for drying at low temperatures materials that may be tumbled — crystals, heat-sensitive chemicals and foods, metallic powders, fish meal, shellac, milk, sugar — Stokes Rotary Vacuum Dryers are application-engineered and built for the vacuum processing of these products. They are also highly efficient units for the recovery of alcohol and other valuable solvents.

The Stokes Advisory Service assists plants in solving *drying problems*... controlled tests are made on semi-plant-scale equipment... complete operating procedures and cost estimates are provided.

It pays to ask Stokes to work with you in the development of methods to improve your products. Write... today... for detailed information.



FJS **F. J. STOKES MACHINE COMPANY**

F. J. Stokes Machine Co.
5600 Tabor Road
Philadelphia 20, Pa.

Send me your complete catalog on STOKES Processing Equipment.

Name _____ Title _____

Company _____

Address _____

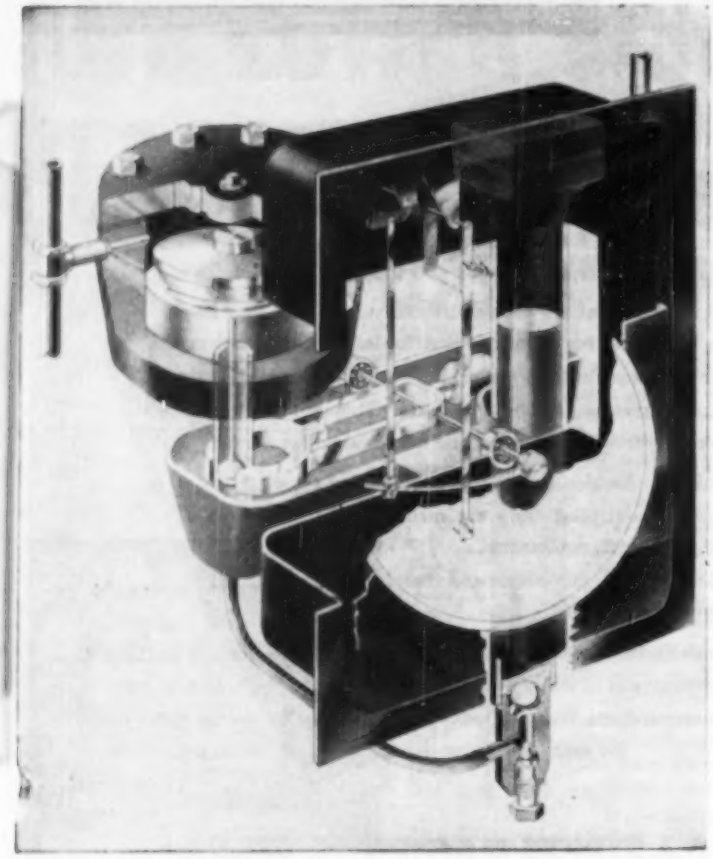
City _____ Zone _____ State _____

HAYS-PENN MAGNA CLUTCH FLOW METERS

Suitable for working pressures up to 2500 psi

NO Stuffing Box
Torsion Tubes
Bellows
Diaphragm
Pressure-tight Bearing

therefore
NO HYSTERESIS



Highest accuracy

Maximum power provided by large float and long float travel

Minimum friction because of magnetic coupling

Ambient temperature compensation

Precise calibration check at 50%

Complete safety

No leakage possible of explosive, inflammable, or toxic fluids

Great flexibility

5 interchangeable range tubes 17 to 750" with easy range adjustment over entire span

Lowest maintenance

Fully accessible manometer...Only one internal moving part (the float)... No bearing to service...Mercury volume and level not critical...Positive mercury check valves...Mercury easily drained.

Write for:
Bulletin 50-915

THE **HAYS** CORPORATION *MICHIGAN CITY 9, INDIANA* • Automatic Combustion Control • Boiler Panels •

Hays-Penn Flowmeters • Veriflow Meters and Veritrol • Gas Analyzers • Draft Gages • Combustion Test Sets • CO_2 Recorders • Electronic Oxygen Recorders

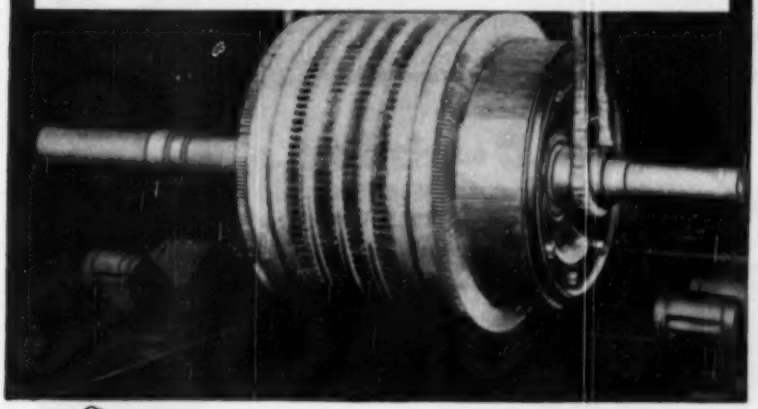
G-E Chemical Progress

News of developments from General Electric's Chemical Department that can be important to your business.

ONE FOR ALL...

A new, low-cost, all-purpose insulating varnish, designed to reduce expense and simplify inventories, is proving increasingly popular in the electrical repair industry. This General Electric insulation development is suitable for coils of all types, providing electrical, chemical and mechanical properties formerly found only in special-purpose varnishes.

Motor repair men report that this new varnish (G-E 9574 A) penetrates easily into the deepest coils and bakes at lower temperatures than most other synthetic varnishes. No special thinner is required—just petroleum spirits—and users find that the new varnish requires less cover coat.



G-E CHEMICAL BREVITIES

Electrical manufacturers find that G-E mica plate, tape and tubing offer exceptional dielectric strength and reduce power loss. Stable under varying atmospheric conditions, these insulating materials are particularly useful at elevated temperatures.

•

Refrigerators this year are more beautiful, more convenient than ever—thanks to G-E plastics contributions to the industry, which include "snack boxes," double-panel freezer doors and breaker strips.

•

Tight wrapping on cables, armatures and other coils is possible with G.E.'s highly flexible and mechanically strong varnished cloths and tapes.

ALL'S WELL FOR WELDERS

G-E silicone insulation is helping to make possible new welding transformers that are smaller, lighter and longer-lasting than ever before. The new silicone insulation means increased operating dependability, too, for it resists high temperatures and is water-repellent.

WHAT WOMEN WANT

A recent national survey shows that 41% of 1,051 women interviewed would prefer to have General Electric Textolite* plastics surfacing in their kitchens. (The nearest other leading manufacturer was mentioned by only 19%.) These resin-impregnated laminated tops are a product of G-E chemical research and product design.

WANT MORE INFORMATION?

For complete details about any of the G-E Chemical Department products or processes described on this page, just write to Chemical Dept., General Electric Co., Pittsfield 11, Massachusetts.

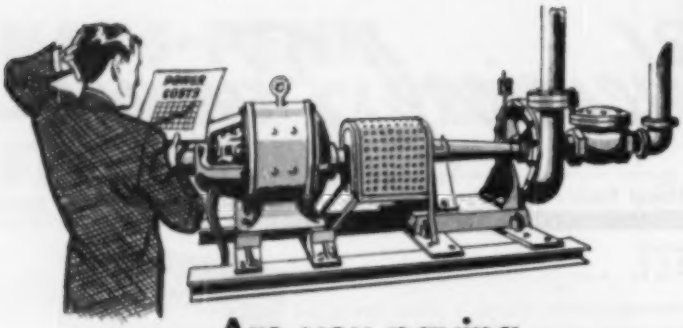
*Reg. U.S. Pat. Off.

G-E Chemical Department plants at: Pittsfield, Mass.; Schenectady, N. Y.; Waterford, N. Y.; Coshocton, Ohio; Decatur, Ill.; Taunton, Mass.; Anaheim, Calif.

You can put your confidence in

GENERAL ELECTRIC

PLASTIC COMPOUNDS • SILICONES • INSULATING MATERIALS • GLYPTAL® ALKYD RESINS • PLASTIC LAMINATING, MOLDING, AND EXTRUDING



Are you paying

OLD-AGE COMPENSATION

for your obsolete pumps?

Check these three factors and see how much you can save by replacing outdated pumping equipment!

CHECK YOUR POWER COSTS and compare the efficiency and power requirements of your old pumps with those of modern I-R pumps. You may be amazed at how much you can save in power alone by replacing obsolete pumping equipment with today's more efficient I-R pumps. When one company recently replaced two old units with new I-R pumps the power bill dropped immediately from $1100 to $800 a month—*a saving of $3600 a year in power consumption alone.*

CHECK YOUR MAINTENANCE COSTS and see just how much it's costing you in both time and new parts to keep your old out-of-date pumps in operating condition. Today, lower maintenance is more important than ever before when it comes to keeping down your operating costs. And you'll find that *ease of maintenance—and less of it*—is inherent in the design and construction of I-R pumps. That's why they'll make such a big difference in your pump maintenance costs.

CHECK YOUR PRODUCTION CHARTS—They'll show you if your operations have lagged because of excessive "down time" brought on by pumps that can no longer keep pace with the modern high-speed processes of today. A higher availability status for your pumping equipment means higher production. You can depend on I-R pumps for continuous service because they're job engineered, *with design, construction, and materials to meet each specific application.*

Your nearest Ingersoll-Rand engineer will be glad to make a study of your present pumping equipment. He can help you determine if you have any pumps in service that can profitably be replaced by more modern, efficient I-R units.

Ingersoll-Rand

Cameron Pump Division

11 BROADWAY, NEW YORK 4, N.Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

532-10

There's a COST-SAVING I-R PUMP for every liquid-handling job!

Motorpumps
Capacities to 1800 gpm
Pressures to 260 psi

Single-Stage Pumps
Capacities to 50,000 gpm
Pressures to 150 psi

Two-Stage Pumps
Capacities to 2200 gpm
Pressures to 450 psi

Multi-Stage Pumps
Capacities to 3000 gpm
Pressures to 3000 psi

Vertical Pumps
Capacities to 80,000 gpm
Pressures to 1500 psi

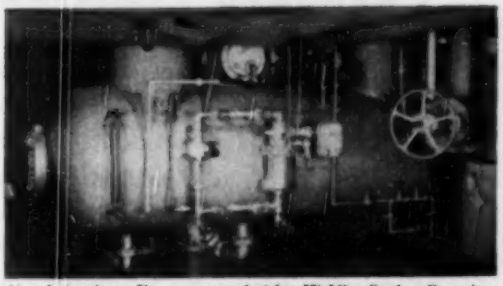
Engineering & Construction by Gilbert Associates—Reading, Pennsylvania

Maximum Solids—0.5 ppm
With an ALCO Evaporator

From the fast-moving coal conveyor to the powerful 30,000 kw. generator, every operation is geared for the swift, efficient production of power at the Hickling Station of the New York State Electric & Gas Corporation.

Typical of this efficiency is an ALCO evaporator of new design which performance tests show will produce vapor with maximum solids carryover of 0.5 ppm or less. Such ALCO features as a special vapor scrubber and an exclusive integral deaerating heater insure top performance of this unit. The deaerating section, for example, is fully effective so that ALCO guarantees feedwater leaving this section to have zero free carbon dioxide content and 0.03 cc. of oxygen per liter.

Check these other Alco design features . . . exclusive "flex-tube" action for descaling . . . separate, removable channel and cover . . . patented ALCO compression bolting . . . all add to the efficiency of the evaporator. Write now for more details or call the nearest ALCO Sales Engineer at Chicago, Cleveland, Houston, Kansas City, Los Angeles, New York or Tulsa. Plants at Dunkirk, N. Y. and Beaumont, Texas.



New design ALCO Evaporator on the job at Hickling Station. Capacity, 7000 pounds of water per hour at 230.3° F. and 24.2 p.s.i.a. when supplied with steam at a pressure of 56.5 p.s.i.a.

ALCO

ALCO Products Division
AMERICAN LOCOMOTIVE COMPANY

In step with tomorrow—ALCO AIRCOOLERS, Heat Exchangers, Evaporators, Feedwater Heaters, Pressure Vessels, Pipe

This time...

USE

WIGTON-ABBOTT'S

Complete Service

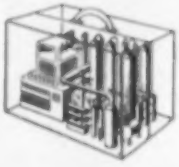
FROM

PLANNING

TO

PRODUCTION

"Packaged Plant Construction"



A service by Wigton-Abbott Corporation that broadens the definition of plant construction to include creation of the process, designing and installation of equipment, and "delivers" the complete plant, ready for operation. • To perform and to coordinate these complex functions, Wigton-Abbott Corporation employs the experience and skill of engineers and architects—including specialists in all branches of chemical, mechanical, electrical, civil and industrial engineering. The Construction Department is staffed and equipped to erect any type of industrial plant. • A Wigton-Abbott Corporation representative will be glad to consult with you on any phase of plant design and construction.

Yours for the asking

"Packaged Plant Construction"
Reading time, only 10 minutes—but it will save you many hours by answering basic questions.

Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS... PLAINFIELD, NEW JERSEY

. . . in your detergent

Carbose* can do it. Carbose is Wyandotte's "detergency promoter." As little as 1% of Carbose added to a synthetic detergent can increase soil removal and whiteness retention properties by 20 to 80%.

Here's what three laundries say about detergents promoted with Wyandotte Carbose:

"We got soft water quality in a hard water plant with a decrease in the cost of supplies."

"We got an outstanding improvement . . . reduced the cost of our supplies by 24.4%."

"Significant increase in quality . . . reduction in cost of supplies 50%."

These are just a few of hundreds of field observations made with different formulations of Carbose with synthetic detergents and builders. We think they show that it might be worth while for you to investigate Wyandotte Carbose. Why not write for samples today?

*Reg. U. S. Pat. Off.

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte Chemicals Corporation
Wyandotte, Mich. • *Offices in Principal Cities*

Wyandotte
REG. U. S. PAT. OFF.

CHEMICAL

Stability

Plant and Personnel

Protection

● For many years "the only completely satisfactory answer to many corrosion and contamination problems," genuine Lapp Chemical Porcelain is now available in a series of valves completely armored in acid-resisting heat-treated silicon aluminum. Choose the Lapp armored porcelain valve over expensive alloy or lined valves for greater economy—chemical stability—plant and personnel protection against carelessness or accident. Standard bolt flanges integral with armor. Y-valves in 1", 1½", 2", 3", 4" and 6" sizes; angle valves in 1" and 2" sizes; flush valves in 1½", 2" and 3" sizes (for tank outlets 3", 4" and 5"). Write for descriptive literature and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 303 Maple St., LeRoy, N. Y.

Y VALVE

Lapp
ARMORED
PORCELAIN
VALVES

ANGLE VALVE

FLUSH VALVE

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

New WALWORTH High Pressure LUBRICANT GUN

Save Time—Save Money. With this simple, rugged portable device, it is possible to save in excess of 50% of the time generally required to lubricate Lubricated Plug Valves. It will economically and efficiently handle the stiffest grades of Walworth lubricants.

The gun is self-priming, may be used in any position, and because of its safety features cannot injure the valve.

High pressure button type grease gun fittings—instead of the lubricant screw which is usually furnished—are available for installation on the valve. By painting the valve a distinguishing color to show the service under which the valve operates, and painting the barrel of the gun with the same color, untrained personnel can lubricate valves with the assurance that the correct lubricant has been used.

Walworth has improved and simplified its lubricants so that with a minimum of nine lubricants it is now possible to handle satisfactorily practically all industrial services. The new Walworth 517 and 514 lubricants will take care of 95% of the service conditions encountered in the handling of Petroleum Products and Gas Pipe Lines. The other seven lubricants will take care of most other petroleum, chemical, and industrial services.

All Walworth lubricants are available in Jumbo stick size, individually wrapped and packed 10 sticks per box. Two Jumbo size sticks will completely fill the barrel of the Walworth Lubricant Gun.

for lubricating lubricated plug valves

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

For best results use Walworth Lubricants in Walworth Lubricated Plug Valves.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Another of the Jobs* that Stainless Steel does BEST

*Chemical Containers

that are SAFER, LIGHTER, MORE ECONOMICAL TO STORE AND SHIP

FOR YEARS and years, commercial acids and other "bad" chemicals were shipped in glass carboys protected up to the neck by unwieldy wooden crates. At very first glance, you will see how these modern stainless steel chemical containers were vast improvements in strength, safety and ease of handling, but there were other important advantages.

For one thing, each stainless drum holds 25% more acid by volume than a carboy, yet weighs some 10% less when filled. The saving in freight rates alone, every time the drum is shipped and returned, is more than 30%. In addition, the stainless container is designed to self-stack, solidly and securely. A two-high stack of drums, compared to unstacked carboys, gives you about three times as much gallonage per square foot of floor space in a freight car, truck bed or warehouse.

Like so many other applications for Allegheny Metal, therefore, these chemical containers are important to the national economy. Stainless steel is a vital material, both in essential industrial uses and in the building of armament. ● Let us help you to use it wisely and well, to get the least possible wastage per ton. *Our engineers are at your service.*

* * * *

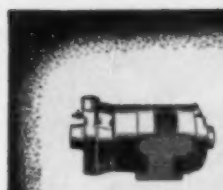
Complete technical and fabricating data—engineering help, too—are yours for the asking from Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. . . . the nation's leading producer of stainless steel in all forms. Branch Offices are located in principal cities, coast to coast, and Warehouse Stocks of Allegheny Stainless Steel are carried by all Joseph T. Ryerson & Son, Inc. plants.

You can make it BETTER with

Allegheny Metal

WBD 3264

AL TIME-TESTED STAINLESS STEEL



SSR Fractional hp.

Electrifugal 1 to 10 hp.

SSU 10 to 125 hp.

ALLIS-CHALMERS PACKAGE PUMPS

NEW Electrifugal Pump

ENDS SOME MAINTENANCE JOBS, SIMPLIFIES OTHERS TO CUT PUMPING COSTS!

NO OTHER CLOSE-COUPLED PUMP can offer you *all* of these money-saving advantages you get from an *Electrifugal* pump:

1. New sealed motor bearings eliminate usual bearing maintenance costs. Cannot be over or under lubricated.
2. New unit-cast iron frame has no adapter between pump and motor; provides great rigidity and broad, stable base.
3. New improved double seal on front motor bearing keeps liquid out of bearing under all normal operating conditions.
4. New streamlined design has smooth, easy-to-clean exterior, better appearance.
5. Large opening in frame between pump and motor makes packing maintenance quick and easy.
6. Pump and motor are designed, assembled and tested as a unit in the same plant to work together and cut your cost.
7. Nation-wide application engineering and service help you select the right pump for your job and keep operating costs low.

Other pumps in the Allis-Chalmers package pump line feature these same money-saving designs. Get all the facts from your Allis-Chalmers Authorized Dealer or Sales Office. Or write for Bulletin 52B6140. A-3061

ALLIS-CHALMERS, 1147A, SO. 70 ST. MILWAUKEE, WIS.

Electrifugal and *Texrope* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

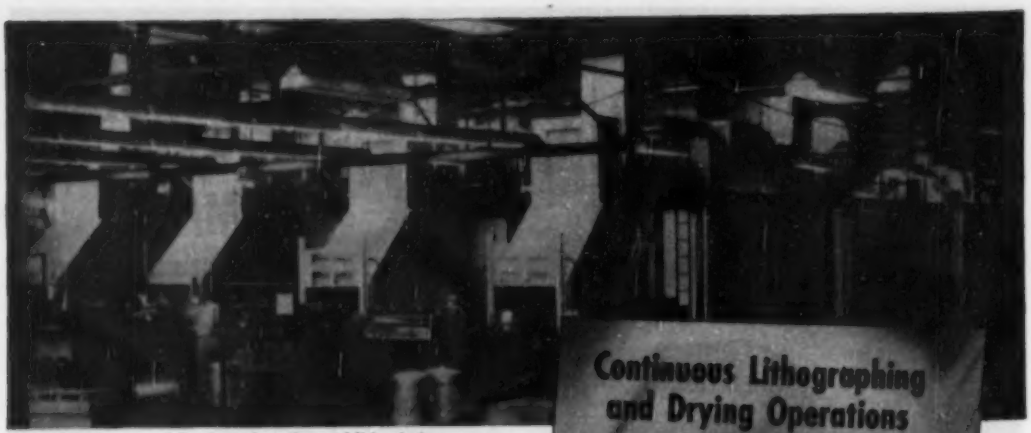
Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



Four of the battery of Gas heated coating and litho drying ovens at American Can Company. Easily accessible, automatic temperature controls actuate the units, and the circulating fans mounted on top of 105-ft. ovens. The ovens utilize the latest principles of forced convection heating.

Continuous Lithographing and Drying Operations at AMERICAN CAN COMPANY

SHOW HOW GAS KEEPS PRODUCTION RATES FROM LAGGING

PRODUCTION BOTTLENECKS in making metal containers have been overcome by reducing the time required for coatings and printing inks to dry. Inside coating prevents chemical action between can and contents, outside printing identifies it. Since the consumption runs into several hundred million cans per year, rapid automatic production machinery is required, and drying operations must keep pace with it.

Efficient and flexible GAS has done just this at the new St. Louis, Mo., plant of American Can Company. Here, Gas-fired convection ovens gear the drying cycle to the production speed of lithographing and coating lines. Heaters in these drying ovens are direct Gas-fired external type, supplied with inspirator cluster burners, accurately and automatically controllable to meet requirements of the process. The litho drying ovens have three heat zones—two at 300-325° F. for drying—and a third for preheating the conveyor. Coating ovens have three drying zones, automatically regulated to temperatures of 300° to 420° F., and a conveyor heating zone, but are otherwise like the litho ovens.

After the flat sheets are printed, coated and dried, they are cut into blanks for forming. GAS melts the solder used to close the longitudinal seams, and as the cans move along the conveyor, a series of small GAS flame jets play on the seam to effect a satisfactory seal.

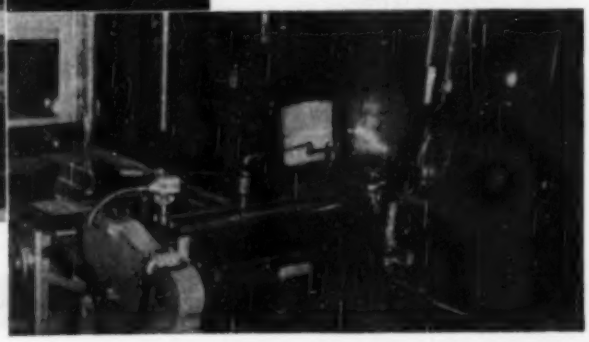
By stepping up the drying cycle in metal container manufacturing, GAS fulfills another of its major productioneering roles. It's this effective use of flexible, precisely-controlled Gas Equipment which overcomes so many heat-processing slowdowns. Your Gas Company Representative will show you how it can be done.

MORE AND MORE... THE TREND IS TO GAS

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE
NEW YORK 17, NEW YORK

Steel sheets are fed through the tandem printing presses (foreground) and then into the litho drying ovens.

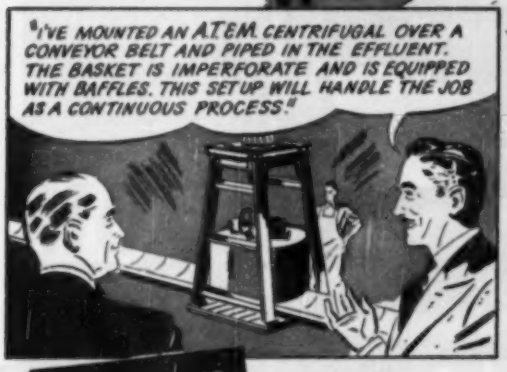


After lithographing, the plates are varnished in this press, and conveyed to the litho oven.

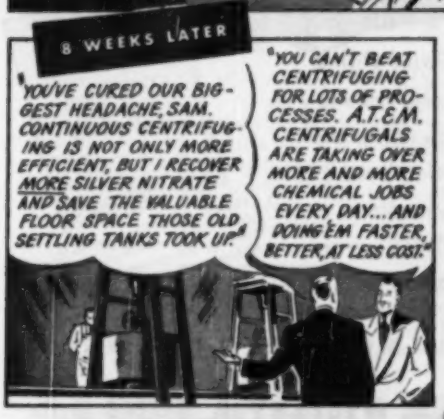
Changing from batch to continuous processing boosted efficiency, saved valuable space

ANOTHER A.T.E.M. SUCCESS STORY BY *Sam Spinner*

"RECOVERING SILVER NITRATE FROM PROCESS EFFLUENT IN THESE SETTLING TANKS IS SLOW AND COSTLY, SAM. WE NEED A FAST, CONTINUOUS, SMALL-SPACE PROCESS."
"HMM M... THAT'LL TAKE SOME DOING, BUT I'M SURE I CAN HELP YOU."


"I'VE MOUNTED AN A.T.E.M. CENTRIFUGAL OVER A CONVEYOR BELT AND PIPED IN THE EFFLUENT. THE BASKET IS IMPERFORATE AND IS EQUIPPED WITH BAFFLES. THIS SET UP WILL HANDLE THE JOB AS A CONTINUOUS PROCESS!"

"A CHEMICAL PRECIPITATES THE SILVER NITRATE AND AS THE BASKET SPINS, IT CAKES AGAINST THE BAFFLES WHILE THE LIQUID IS DECANTED OVER THE TOP. THE CAKE IS THEN PLOWED OUT THE BOTTOM ONTO THE MOVING CONVEYOR."


8 WEEKS LATER
"YOU'VE CURED OUR BIGGEST HEADACHE, SAM. CONTINUOUS CENTRIFUGING IS NOT ONLY MORE EFFICIENT, BUT I RECOVER MORE SILVER NITRATE AND SAVE THE VALUABLE FLOOR SPACE THOSE OLD SETTLING TANKS TOOK UP."
"YOU CAN'T BEAT CENTRIFUGING FOR LOTS OF PROCESSES. A.T.E.M. CENTRIFUGALS ARE TAKING OVER MORE AND MORE CHEMICAL JOBS EVERY DAY... AND DOING 'EM FASTER, BETTER, AT LESS COST."

Let us bring you up to date on what modern centrifuging can do. JUST MAIL COUPON — NO OBLIGATION

SAVE TIME, SPACE AND COSTS WITH

A.T. and M. CENTRIFUGING

AMERICAN TOOL & MACHINE COMPANY
1415 Hyde Park Ave., Boston 36, Mass.

Please send information on centrifuging applied to the following processes:
☐ Extraction ☐ Filtration ☐ Dehydration ☐ Coating ☐ Precipitation
☐ Sedimentation ☐ Impregnation

Write here any other process .....

Name ..... Title .....

Company .....

Street .....

City ..... Zone ..... State .....

New model K

Centrifugal Sand Pump

ENGINEERED FOR GREATER PUMPING ECONOMY

PATENTED

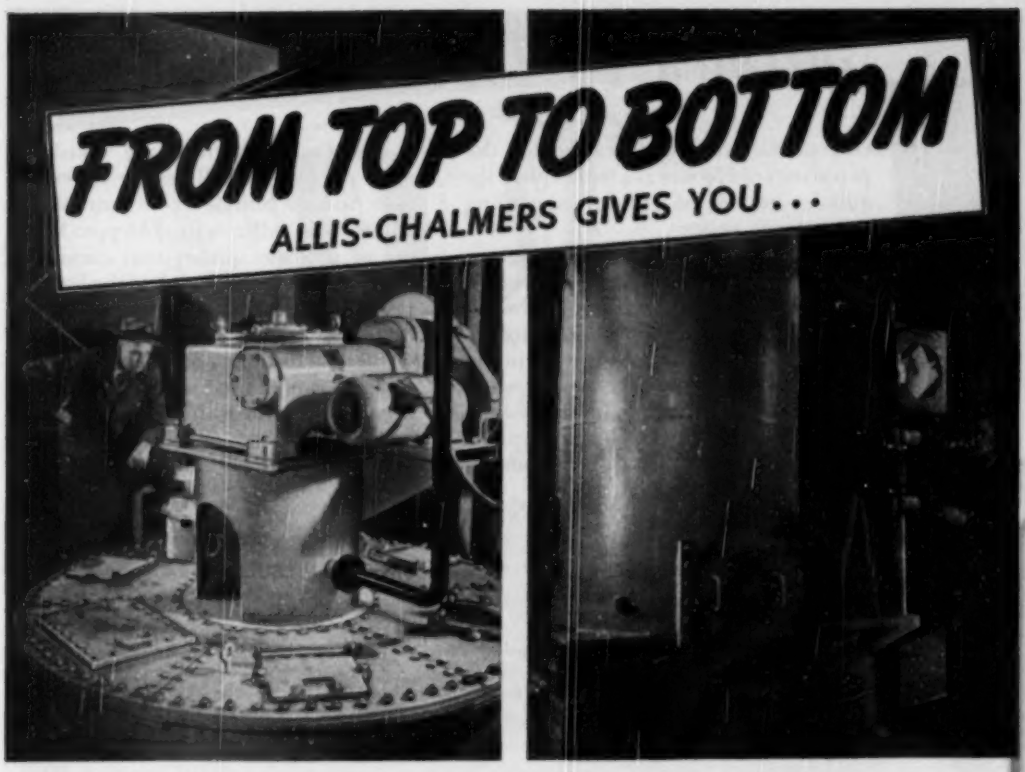
The new WILFLEY Model K Centrifugal Sand Pump features important mechanical improvements which give you substantial dollar savings—in power and production. This new pump delivers continuous, trouble-free operation—stepped-up production—dependable performance in handling sands, slimes or slurries. Individual engineering on every application—an economical size for every requirement. Write or wire for details.

Write for Wilfley Bulletin which details the special features, capacities, dimensions and other pertinent information.

BUY WILFLEY FOR COST-SAVING PERFORMANCE

WILFLEY centrifugal PUMPS

A. R. WILFLEY & SONS, INC.
DENVER, COLORADO, U. S. A.
New York Office: 1775 Broadway, New York City



MONEY-SAVING Continuous Solvent Extraction Equipment

TALK IT OVER *with Allis-Chalmers.* That's good policy for *any* firm planning new equipment for solvent extraction of vegetable oils.

When you buy an entire plant from A-C, you get the exact type and size of mill you want—designed to provide efficient, money-saving operation from top to bottom. And with the purchase of an entire plant you get individual process engineering plus *correlated* preparation, extraction, electrical, and pumping equipment.

If you are interested only in one or several pieces of machinery for your mill, A-C's wide line offers equipment for almost any solvent extraction need.

In cottonseed, soybean, corn germ, rice bran, and other products, Allis-Chalmers has pioneered in the production of solvent extraction equipment. Perhaps A-C can start *your* mill, too, on the road to greater profits. Mail handy coupon for complete information.

ALLIS-CHALMERS

Pioneers in the Field of Continuous Solvent Extraction

ALLIS-CHALMERS, 1147A, SO. 70 ST. MILWAUKEE, WIS.

☐ Please send solvent extraction bulletin 1386757A.

☐ Am interested in information on solvent extraction of.....

☐ Please send A-C representative.

Name

Title

Firm

Address

City State A-3099

Sulfides To Your Schedule...

One of the important reasons for the popularity of Hooker as a basic source for Sulfides lies in the Hooker scheduling and delivery policy.

Much time and thought has been given to shipping, and this planning combined with Hooker's location at one of the important rail centers of the nation, enables Hooker to deliver—on schedule—as promised. This permits you to keep your inventory investment to the minimum while at the same time our ample stocks enable you to meet additional requirements without any difficulty.

All Hooker products are noted for their purity and Sulfides are no exception. Sodium Sulfide (Fe 8 ppm Max.), and Sodium Sulfhydrate (Fe 5 ppm Max.) are of uniform quality that eliminates costly variations in quality of the finished product. There are also added savings due to the rapid and complete solubility of these high purity Sulfides. The clean solution can be used without settling or decanting—a worthwhile time saver.

A request on your company letter head will bring samples and Technical Data Sheets.

SODIUM SULFIDE—Na_2S

Mol. Wt. 78.1
M.P. ..... 100°C

Light buff colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether. Also available in solid form.

Analysis

Na_2S	60 to 62%
NaCl	1.5% Max.
Other Na Salts	2.0% Max.
Fe	8 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	35% Min.

Uses

In manufacture of dyestuffs, chemical intermediates, paper pulp, soap and rubber, as an ingredient of dye liquor for textile dyeing; boiling out linen; ore flotation and metal refining; in unhairing hides and wool pulling; desulfurizing viscose rayon.

SHIPPING CONTAINERS

Flake: Steel drums ..... 90 & 350 lbs. net
Solid: Steel drums ..... 625 lbs. net

SODIUM SULFHYDRATE—NaSH

(sodium hydrosulfide)

Mol. Wt. 56.1
M.P. ..... 55°C

Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether.

Analysis

NaSH	70 to 72%
Na_2S	2.5% Max.
NaCl	0.8% Max.
Na_2SO_3 and $NaHCO_3$	0.4% Max.
Fe	5 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	28 to 26%

Uses

In preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithio-benzoic acids, sodium thiosulfate; in unhairing hides, in desulfurizing viscose rayon.

SHIPPING CONTAINERS

Lacquer-lined steel drums . . 90, 350 lbs. net

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

HOOKER CHEMICALS

10-1065

BENZOIC ACID • CHLOROTOLUENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

D.A.*

An HONORARY DEGREE Conferred on

MIDWEST WELDING ELBOWS

By Pipe Welders Everywhere

Pipe welders who know Midwest Welding Elbows have conferred upon them an honorary degree unique in piping . . . "D. A." for "dimensional accuracy".

This degree was earned for Midwest Elbows by their unique process of manufacture. In this process, developed by Midwest, the elbow is first made slightly oversize. After welding it is reheated to forging temperature and brought to final size in compression dies. This relieves forming and welding stress . . . assures true circular cross-section, controlled wall thickness and accurate radius, included arc and tangents. The elbows are beveled on special machines which cut both ends simultaneously, holding exact included angle and center-to-end dimensions.

"D. A." is a degree which means a lot to pipe welders. It means that they don't have to waste time lining up inaccurate fittings. It means that they don't have to spend time and weld metal in compensating for bad fit. And it means that they can produce better, cleaner, stronger welds with less trouble.

"D. A." saves money for you when it saves time and trouble for welders. Use Midwest "D. A." Elbows on your next job. Call your Midwest Distributor; there is one conveniently near you.

MIDWEST PIPING & SUPPLY CO., Inc.

MAIN OFFICES: 1450 SO. SECOND STREET, ST. LOUIS 4, MO.
Sales Offices: New York 7—30 Church St. • Chicago 3—79 W. Monroe St. • Los Angeles 33—520 Anderson St. Houston 2—1213 Capitol Ave. • Tulsa 3—533 Mayo Bldg. Boston 27—426 First St. • Stocking Distributors in All Principal Cities

* Dimensional Accuracy

TRAIN VIBRATIONS DON'T BOTHER RUGGED C.H.W. WATER COOLING TOWERS

Speeding express trains and thundering freights can cause serious vibrations with damaging effects on equipment located nearby. Here's a C. H. W. water cooling tower installed so close to one of the country's heaviest traveled railroads that passing trains nearly knock your hat off. This tower of The Bayer Company, aspirin manufacturers at Trenton, N. J., is as good as the day it was built. And there are many good reasons why they haven't had any "headaches" with it. In a C. H. W. cooling tower you get a sturdy structure, assembled by experts, with redwood members rugged enough to withstand stresses, strains and vibrations (caused by trains or most anything else up to hurricane winds of 100 m. p. h.). Wood fill is of sufficient size and weight to "stay put" without the use of nails, and vertical members are securely bolted. A distorted distribution system or wood fill "out of place" affects the efficiency of the tower—hence the reason for C. H. W.'s "vibration proof," rugged construction. For other exclusive features of C. H. W. towers, write for literature.

C. H. WHEELER MANUFACTURING CO.
1508 Sedgley Avenue, Philadelphia 32, Pa.
REPRESENTATIVES IN MOST PRINCIPAL CITIES

C. H. Wheeler

STEAM CONDENSERS · WATER COOLING TOWERS
EJECTORS · STEAM JET VACUUM REFRIGERATION
OF PHILADELPHIA

"We recommend . . ."

Recommendations from Wyandotte Technical Service are not "off-the-cuff." Here's how we worked with one Caustic Soda customer.

We recommended that he use liquid caustic rather than solid. We helped him appraise his plant conditions. We drew up schematic diagrams outlining the handling of liquid caustic. We showed him how to dilute the liquid to the concentrations he needed. We drew up a cost estimate for the handling system. We recommended the types of equipment we felt he needed.

He turned our prints over to his engineers for execution. But we continued to advise him throughout the construction program. We inspected the finished system. And we were on hand when the switch was thrown for the first tank car shipment.

In one year's time, his savings paid for the installation . . . and began to return him a profit.

Service like this is not for the "favored few." It is available to any Wyandotte customer. Not just for Caustic Soda, but for Soda Ash or any Wyandotte product. Wyandotte Technical Service is not a sales gimmick. It is an outgrowth of our feeling that we should share with our customers the accumulated experience of 60 years of chemical making.

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte Chemicals Corporation
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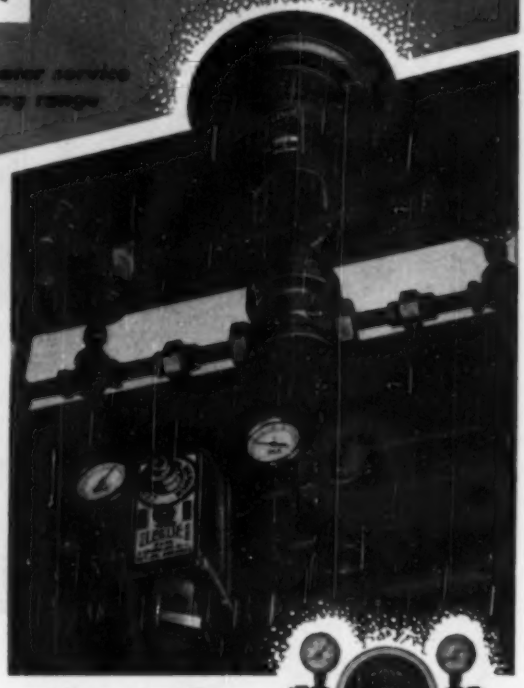
Reduce Water Bills and Maintenance Costs with the New TRADE LESLIE MARK THERMOSTAT

Specially designed for cooling water service with greatly increased throttling range



It is a recognized fact that water cooled equipment such as air compressors, diesel engines, etc., perform better and require less maintenance if cooling water temperature is accurately maintained. The importance of cooling water control has become accentuated with the growing need for conserving water. The new LESLIE Thermostat and diaphragm Regulating Valve make an ideal Temperature Controller for economic, reliable control of cooling water.

The bi-metallic Thermostat regulates the flow of water (or air) to the diaphragm of the Regulating Valve to maintain a constant water temperature at the bulb location. A slight temperature change repositions the Regulating Valve and regulates the flow of cooling water.

Features of the New LESLIE Thermostat

THROTTLING RANGE—Wide or narrow throttling range can be furnished with adjustable temperature ranges, 32°—400°F and 300°—600°F.

BI-METALLIC ELEMENT—Expansion or contraction of metallic tube provides positive operating force.

SIMPLE—Few moving parts. Simple pilot valve operates without stuffing box or plunger.

RUGGED, RELIABLE—Wear and corrosion-resistant parts give long life. Accuracy of regulation comparable to instrument control.

For small units requiring only ½ or ¾" cooling water supply use the LESLIE Self-Contained Classes MDR, MCR or MBR Temperature Regulators.

LESLIE Thermostat with calibrated dial for easy adjustment

LESLIE Thermostat with 32°-400°F adjustable range

Lowest Overall Cost per Operating Year

Send For — Bulletin 464-B
"Temperature Regulators and Controllers"

50th YEAR-JUBILEE 1900—1950

Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory-trained engineers are located.

Albany, N. Y.	Cincinnati, Ohio	Indianapolis, Ind.	Mobile, Ala.	Penn Yan, Ohio	Portland, Ore.	Seattle, Wash.
Atlanta, Ga.	Cleveland, Ohio	Kansas City, Mo.	Monroe, La.	Portland, Ore.	Providence, R. I.	Spokane, Wash.
Baltimore, Md.	Denver, Colo.	Kingsport, Tenn.	Montreal, Canada	Providence, R. I.	Richmond, Va.	St. Louis, Mo.
Beaumont, Tex.	Detroit, Mich.	Los Angeles, Calif.	New Orleans, La.	Richmond, Va.	Rochester, N. Y.	Syracuse, N. Y.
Birmingham, Ala.	Galveston, Tex.	Louisville, Ky.	New York, N. Y.	Rochester, N. Y.	Rutherford, N. J.	Toronto, Canada
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LESLIE CO.

FLOATLESS LEVEL CONTROLS • PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS
SELF CLEANING STRAINERS • PUMP GOVERNORS • TEMPERATURE REGULATORS
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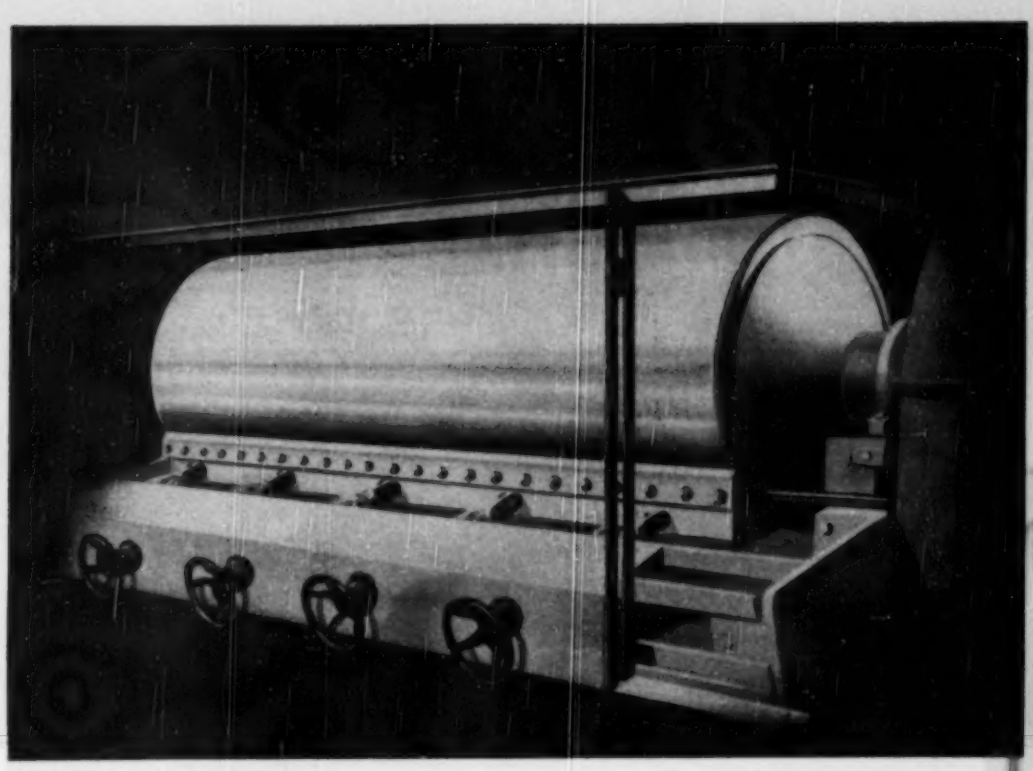

How Two Lukenweld Driers Upped Production 41%

If you want to increase production and cut maintenance costs, here's a case history worth studying. It concerns a large eastern pharmaceutical manufacturer who wanted to speed up flake drying of a well-known proprietary product.

All he did was install two flaker units each utilizing a Lukenweld Jacketed Steel Drier Roll in place of units with a roll of another type construction, operating at 80 psi. At the identical pressure, each unit fills a 200-pound barrel of flaked dried material every 7 to 8 minutes against the former time of 10 to 11 minutes. The average increase is 41% and, had pressures been increased, the results would have been even greater. Since installation there has been a further saving. For, despite the action of a 30% saline solution, the chromium plating on the faces of the steel plate rolls has lasted over six years while similar plating on other type rolls required refinishing every year and a half.

If you have a job calling for roll drying, you can probably do it faster with Lukenweld Jacketed Steel Drier Rolls. They deliver more even heat, are mechanically safe—since steel plate will never fail by shattering—and can be operated at pressures up to 350 psi or higher. For full information on flaker and other drying and processing machinery for the chemical field write, Lukenweld, Division of Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

Improved machinery for improved processes through engineering

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Metal & Thermit's ability to supply a widely diversified group of tin chemicals is a result of nearly fifty years of tin development and supply.

Don't lose sight of Sn! . . . in one form or another it may be the answer to your problem. And, M & T . . . the specialist in tin . . . offers technical service and advice in connection with any of its products.

We invite your inquiry. Literature is available—and we shall be pleased to discuss tin or tin chemicals with you at any time.

METAL & THERMIT CORPORATION
100 E. 42nd ST., · NEW YORK 17, N. Y.

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YOU benefit when these men go to school!

These men are Standard Oil lubrication specialists, skilled and experienced in the use of modern lubricants. They are representative of the groups who come year after year from Standard Oil Company (Indiana) sales fields throughout the Midwest to learn about new machinery and the most up-to-date methods of lubricating them. In lecture rooms and in well-equipped laboratories, they are taught new ways to raise economy and efficiency of your operations.

The benefits held out to you by these lubrication specialists are multiplied by a service-distribution set-up that is unique in the oil industry. To serve your midwest operations, Standard Oil has located practically right in your own backyard a completely stocked warehouse and the office headquarters for a lubrication specialist. The nearness of this service-supply center *means faster deliveries to you* of necessary fuels and lubricants. It assures you of getting the product you need when you need it. It puts the services of the lubrication specialist at your immediate disposal.

These advantages are well worth investigating. Arrange, now, for the visit of a lubrication specialist. If your plant is located in any of the states below, simply phone your nearby Standard Oil service-supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

3 IMPORTANT ADVANTAGES

Standard Oil's Lubrication Service is especially geared to serve your midwest operations.

1 **SERVICE-SUPPLY POINTS** are near your plant. You are assured of fast deliveries, prompt lubrication engineering service.

2 **LUBRICATION SPECIALISTS** have been specifically trained in Standard Oil Lubrication Engineering Schools to help you obtain the maximum benefits from lubricants and fuels.

3 **RESEARCH AND TECHNICAL FACILITIES** are geared to help solve your specific lubrication problems.

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STANDARD OIL COMPANY (INDIANA) STANDARD

Bulletin on POROUS MEDIA

by CARBORUNDUM
TRADE MARK

NO. 9 MAY, 1950

Porous Disc Underdrains for Smaller Softeners and De-Ionizers

In rapid filters and large softeners, ALOXITE aluminum-oxide underdrain plates are already used extensively. The reasons are obvious—these plates eliminate graded gravel, with all its costly difficulties—and they permanently protect the media.

This success with large installations has focused attention on the possibility of using similar material for smaller-capacity units. Such material is available in the form of ALOXITE porous discs. Applied to smaller de-ionizers and softeners, these porous discs permit the use of more exchange material in a given-size pressure shell. As a result, longer runs are possible. Or, in a new installation, the height of the shell can be decreased for the same amount of exchange material. In actual practice, the user will ordinarily gain the most by keeping to the full-size shell, using more media and taking advantage of the longer runs.

Properties of ALOXITE Porous Media

MATERIAL	Ceramically bonded crystalline aluminum oxide grain of controlled sizes.
GRADES (Pore Size)	**Filter Underdrains**... coarse and very coarse. **Direct Filtration**... range from very fine to medium. **Diatomite Support**... range from fine to medium. **Air (gas) Diffusion**... range from fine to coarse (permeability from 10 to 120).
SOLUBILITY	**In Water and Air**... insoluble at all normal operating temperatures. **In Acids**... generally resistant at all operating temperatures, except to hydrofluoric acid. **In Alkaline Solutions**... ceramic bonds are progressively soluble with time and temperature increases.
STRENGTH	Transverse breaking strength is relatively good ranging from 1000 lbs./sq. in. (coarse grades) to 3000 lbs./sq. in. (fine grades).
REFRACTORINESS	All grades withstand up to 900° C. without softening.
THERMAL SHOCK RESISTANCE	Withstand changes up to 20° C./hr. (Where more severe heat shock exists, ceramically bonded silicon carbide porous media are available.)
POROSITY	Ratio of pore volume to total volume of all grades approximately 33%.
WEIGHT	Approximately 0.09 lbs./cu. in.

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

POROUS BOTTOM TRICKLES...

Ion-exchange and softener units, of the design shown below, are offered as standard equipment by Wilson Engineering Company, Little Rock, Arkansas. The porous underdrain disc is indicated in color in this drawing.

Several other well-known softener and de-ionizer manufacturers can supply units using ALOXITE disc underdrains. These follow a similar split-shell construction.

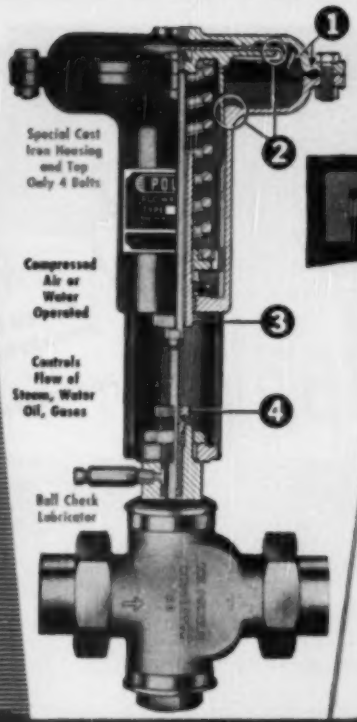
A number of users report that they save time in the initial charging of units which use porous underdrain discs. Zeolite or ion-exchange material is simply dumped into the shell after assembly. Careful placing of support gravel and media is unnecessary.

TECHNICAL DATA
on porous media and their application

is available on request. You may obtain any or all of the following engineering bulletins by writing Dept. H-100.

No. 1 — Aeration of Sewage and Water.
No. 2 — Underdrain Systems for Filters and Softeners.
No. 3 — General Catalog information.

THE CARBORUNDUM COMPANY
Refractories Division
PERTH AMBOY, NEW JERSEY



POWERS FLOWRITE VALVE

VALVE TOP—Durable moulded neoprene diaphragm (1) has positive sealing bead which provides increased sealing action with increasing control pressure. Efficient diaphragm form insures ample and constant operating power thru full travel. Piston Plate Assembly (2) has a free floating thrust plate which absorbs side thrust. Closely guided piston plate maintains stem in accurate alignment.

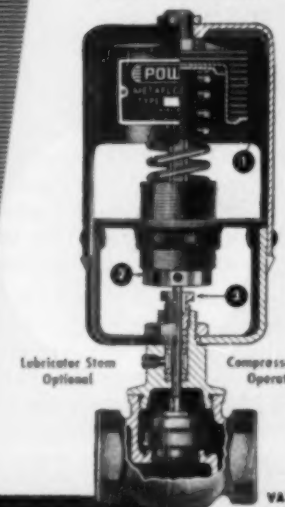
ADJUSTING SCREW—Ball bearing non-rising type. Easily accessible, 180° turning radius with starting pressure adjustable from 0 to 17 psi. Has enclosed rust proofed steel spring for full travel in 5 or 10 psi. control pressure change.

BONNET ASSEMBLY—Polished stainless steel stem in preformed lubricated metallic packing insures long life and low hysteresis.

VARIETY of VALVE BODIES—Sizes ½" thru 8"—For line pressures below 250 psi. Rugged construction to withstand piping strains. Single seat or double seat, bronze and stainless steel trim. Double unions and flanged ends. Available normally open (direct acting) or normally closed (reverse acting) and 3-way type valves.

POWERS BETTER Valve Tops

Packless Valves Available



POWERS METAFLOW VALVE

VALVE SIZES— ½" thru 2"

Bronze bodies, screwed ends. Rugged construction to withstand piping strains.

POWERS *Metaflow Valves* are small, sturdy, light-weight, reasonably priced, suitable for many control applications where the pressure differential does not exceed 75 lbs. per square inch.

1. **HOUSING**—High strength aluminum alloy. Hydraulically formed long life brass bellows provides smooth and powerful stroke.

2. **ADJUSTING SCREW**—Brass with rust proofed steel spring having 15 lbs. adjustment range to give proper sequence operation where required.

3. **BONNET ASSEMBLY**—Polished stainless steel stem in preformed lubricated metallic packing insures long life and low hysteresis.

TRIM—Composition disc with brass integral seat and self-aligning disc holder. Available normally open (direct acting) or normally closed (reverse acting), and 3-way.

METAFLOW NO-PAK VALVES prevent leakage of inflammable or harmful liquids or gases and provide vacuum-protection. Are suitable for use with Freon, oil, gasoline, non-corrosive gases, hot or cold water and low pressure steam.

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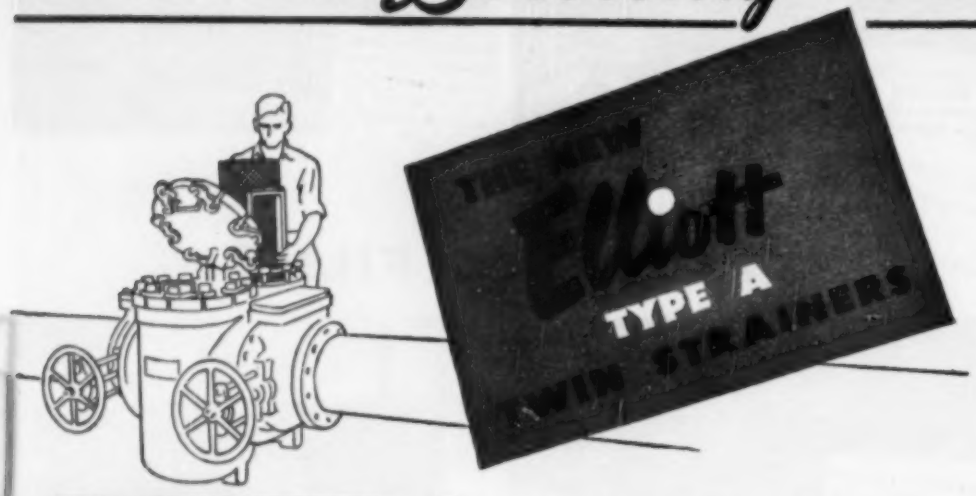
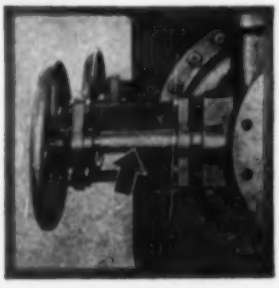


LARGER CAPACITY BASKETS — approximately 5 to 1 ratio with standard mesh. Larger baskets make fewer cleanings necessary.

QUICK-VISIBLE VALVE POSITION INDICATOR cuts out all guesswork as to which straining chamber is working.



SHOWN on this page are a few of the many new, striking advantages in these new Twin Strainers. Other features include steel doors, crack-proof and quick-opening . . . provision for adding a "wearing-plate" to handle extremely corrosive water . . . provision for adding chain drive or valve interlock, without dismantling valves . . . and other features to provide maximum economy in non-stop straining.

Elliott Twin Strainers are available in sizes 1" to 24" for 125 lb. pressure and 1" to 12" for 250 lb. pressure. Full details in the interesting new bulletin, on request. Mail the coupon.

EASY-OUT VALVE DISC — Simplifies replacing of valve disc ring when it is required. No need to dismantle valve.

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Please send me Twin Strainer Bulletin A-13.

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Company _____

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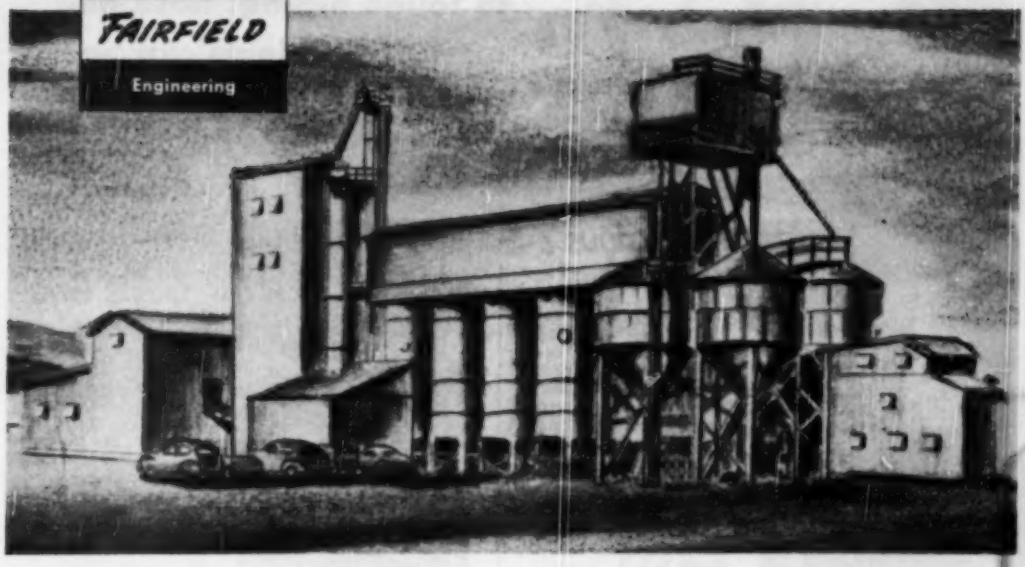

Key to Profitable Plant Operation

If you are building a new process plant, you know that material handling is one of the most important factors in its profitable operation.

For complete assurance that you install the proper material handling system, call in your Fairfield Engineer. He represents a firm who has specialized in the engineering and manufacture of material handling equipment (tailored to each specific installation) for over 30 years.

Write for your free copy of Bulletin 850 that completely describes Fairfield Bulk Material Handling Systems.

Bulk Material Handling Equipment by

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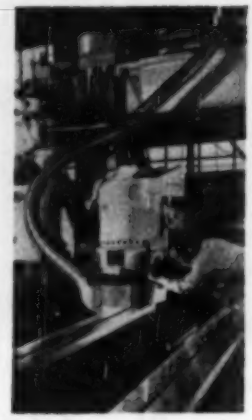
Answers to tough piping, hose and conduit problems can be simple

Hazardous? And how!

Open wiring in grain elevators is forbidden by code requirements. But rigid conduit from switch to motor in this installation would prevent necessary adjustment of the motor drive. SEALTITE* (American Flexible Metal Hose with an impermeable synthetic covering) offered the ideal solution—combining complete safety with flexibility. Photo courtesy Produce Terminal Corporation, Union Stock Yards, Chicago, Ill.



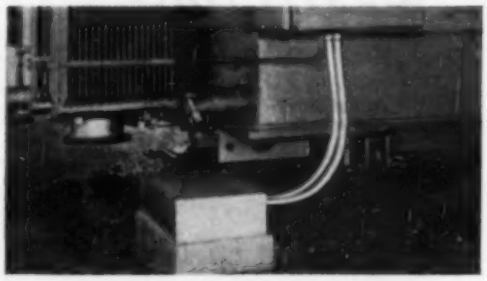
Gulps Grit

The American Flexible Metal Hose shown on this big grinder has plenty of grit—gulps it regularly. It can take it, too, because it's plenty tough as well as flexible. That's a combination of special value in many a job for which this versatile hose should be considered. Photo courtesy Simmons Machine Tool Corporation, Albany, New York.

Ideal for Innumerable uses

American Flexible Metal Hose and Tubing are made in an extensive variety of styles and metals for conveying liquids, many chemicals, air, steam, vapors, oils, greases, gases and semisolids, under severe conditions of corrosion, temperature, pressure and mechanical stress; for protecting wiring and flexible drive shafts; and for connecting piping or ports that vibrate, move, or are out of alignment. For information on any type of American Flexible Metal Hose and Tubing—or for help in special problems—write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

*Trademark



A Neat "Settlement"

They wanted the feed wires to this transformer in conduit. But they expected a settling action might occur which would put a dangerous strain on rigid conduit. So they used SEALTITE*, combining flexibility with complete protection. A neat settlement of a common problem. Photo courtesy Pacific Gas & Electric Company, San Francisco, Calif.

Wherever connectors must move

ANACONDA

American FLEXIBLE METAL HOSE AND TUBING

NEVILLE

The most complete line of

Resins

NEVINDENE*

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"G" RESIN

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Colors

From pale amber to dark brown

Melting Point

5° to 160° C

Uses

In the production of adhesives, electrical insulation, concrete curing compounds and chewing gum.

In the manufacture of floor tile, lacquers, linoleum, paints, paper and pipe coatings, textile coatings, wood penetrants, inks, etc.

In compounding natural and synthetic rubber.

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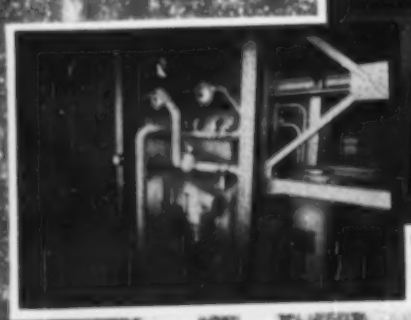

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U.S.I. CHEMICAL NEWS

October ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1950

Reaction with Phosgene Important in Manufacture Of Many Intermediates

U.S.I.'s Wide Experience With Phosgenation Reactions Available to Customers

U.S.I. production facilities and manufacturing know-how can result in substantial savings to chemical manufacturers who wish to take advantage of U.S.I.'s long experience with phosgenation reactions. The importance of phosgene as a reagent in the production of a wide range of intermediates is well known. The two reactive chlorine atoms in the molecule makes possible the ready coupling of other organic molecules while simultaneously introducing the keto structure. Alcohols react with phosgene to form chlorocarbonates (chloroformates) and these in turn react with alcohols to form dialkylcarbonates. Phenols similarly form chlorocarbonates and diaryl carbonates. The chlorine atoms of phosgene react with amines forming carbonyl chlorides which upon reaction with other amines yield substituted ureas. Aromatic hydrocarbons react with phosgene to yield ketones.

U.S.I. has long employed the first of the above reactions to produce ethyl chloroformate and diethyl carbonate. These materials are offered as regular products with rigid specifications. In addition, however, U.S.I. has a background of experience in laboratory, pilot plant and commercial scale on other products resulting from phosgenation reactions. Prospective users are invited to discuss with U.S.I. their requirements for such materials.

Fiber Properties Studied By New Micrograph Method

A host of fiber properties not studied by optical means, such as dyeing of the fiber, lustre, molecular orientation, and physical structure, can now be investigated by recently developed replica techniques for electron microscopy, a research scientist states. Some of the micrographs prepared by the new technique may be interpreted simply as direct, magnified images of obliquely illuminated surfaces, but they are actually radiographic images made by electrons transmitted through a very thin metallic film exactly duplicating the contours of the fiber surface, according to the scientist.

The appearance of oblique illumination is said to be achieved by evaporating a metal of high atomic number and condensing it onto the surface. In a sense, the scientist points out, the surface has been "illuminated" with a beam of metal atoms rather than light.

Superior Replicas Prepared

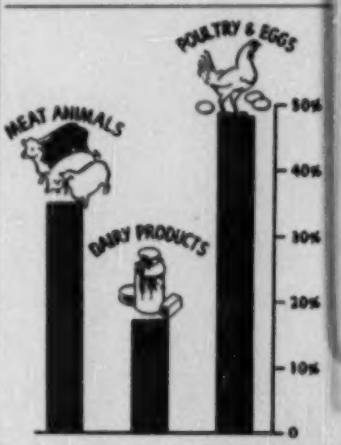
He states that until recently fiber replicas were usually prepared by making an impression of the fiber surface in a thermoplastic material followed by deposition of silica onto this mold with subsequent dissolution of the mold in a suitable solvent. For fibres which readily dissolve in organic solvents, however, superior replicas reportedly may be prepared by depositing the replicating film directly on the fiber.

U.S.I. APF Supplement Compares Favorably With Antibiotic APF Products

University Tests Show U.S.I. APF Supplement Gives Best Grade of Dressed Broiler of All Rations Studied

Farmers may now obtain uniform growth increases in farm animals which are fed rations containing an Animal Protein Factor supplement made by a primary fermentation process, it was reported by U.S.I. scientists at the recent fall meeting of the American Chemical Society.

This new product has been demonstrated in various laboratory tests to perform at least as well as other commercial materials, including APF supplements from antibiotic by-products. In addition, practical tests conducted at a leading university showed that the U.S.I. APF supplement gives the best grade of dressed broiler of all rations that were studied.



Increases over pre-war (1935-39 averages) in production of livestock and livestock products. The tremendous growth of the food industry in the past ten years stems from these farm-production trends.

Graph courtesy of Feeds Illustrated—Prepared by Grantham Graphics

Similarly, at another prominent university, experiments on chicks demonstrated that the U.S.I. product can completely replace fish solubles in many practical formulations, and that it gives a better growth response than is obtained by the use of vitamin B_{12} alone.

Feed Booklets Available

A number of valuable U.S.I. booklets on feed are available to feed manufacturers: "The Road Ahead with APF and Antibiotics," "New Trends in Animal Nutrition," and "Proteins and Amino Acids in Animal Nutrition." For copies, write on company letterhead to the Editor, *U.S.I. Chemical News*.

Protruded Metal Packing Proves Highly Efficient

Comparative tests in distillation equipment indicate that new protruded metal packing is more efficient and economical than any of the previously known "efficient" packings. Key to the new packing's greater efficiency is its property of self-wetting on exposure to liquids, an advantage over types that require flooding for complete wetting.

Possible Use in Liquid Extraction

This automatic wetting property is not the same for all liquids with all metals. Protruded nickel packing, for example, is wetted by hydrocarbons but has almost no affinity for water. Research is anticipated to investigate the extent to which these differences can be used as driving forces in liquid extraction and similar processes. Experiments also indicate that the new packing produces good results in vacuum distillation.

Equipment Size Can Be Increased

The new packing's automatic wetting property is said to give it another advantage in that it suffers less from scaling up equipment size and increasing column diameter than any other packing known. Additional research on reflux distribution methods for large distillation columns is also reported to have produced very promising developments.

Find Antihistaminics Have Antifungal Action

A number of cases of athlete's foot are claimed to have responded to applications of a cream containing one of the antihistaminic compounds. Tests on this and another antihistaminic compound indicate that they possess properties which are inhibitory to pathogenic fungus species and that their activities are therefore not limited to the alleviation of allergic manifestations excited by these fungi.

Publishes New Booklet On Industrial Water Problems

Industrial water problems of all kinds—procurement, treatment, usage, and disposal—and the facilities for coping with them are discussed in a new booklet published by a Pennsylvania company.

ADVERTISEMENT—*This entire page is a paid advertisement* *Printed in U. S. A.*

October ★ **U.S.I. CHEMICAL NEWS** ★ 1950

Chlorophyll Found Useful In Peptic Ulcer Therapy

According to a recent announcement, a new chlorophyll preparation has been obtained which promises to become an important factor in the treatment of peptic ulcers. For some time it has been known that water soluble chlorophyll possessed tissue-stimulating action and that it promoted healing of chronic wounds. It has also been thought that this action could be used to advantage in the treatment of peptic ulcers, provided the chlorophyll could be brought into contact with the site of the lesion. Now, with the announcement of this new chlorophyll preparation, these requirements seem to be met.

Complete Healing in 58 Out of 79 Cases

A total of 79 patients with X-ray-proved duodenal and gastric ulcers were treated with this new chlorophyll preparation without the usual restrictions on diet, smoking, alcoholic beverages, or daily activity. Out of the total number of cases, 58 showed on X-ray examination complete healing in from 2 to 7 weeks. Furthermore, of the 58 cases showing complete healing, 20 cases had no recurrence of symptoms up to 11 months after treatment.

Issues New Bibliography On Container Coatings

A recently issued bibliography on container coatings is said to provide abstracts of some 150 patents and research papers on food and other types of container coatings, published since 1941. Author, inventor, and patent indexes are included.

New Booklet Offered On Phosphate Coatings

A valuable new booklet discussing the latest developments in Phosphate Coatings is now available. It contains 12 pages of detailed information on phosphate coating chemicals for use in paint-bonding, rust-proofing and protecting friction surfaces, and for improving drawing and extrusion.

Polyamide Resins In Water Suspension

Polyamide resins, widely used as heat-sealing adhesives and resistant coatings, are reported available now in water suspensions. A new process, in the pilot-plant stage at the present time, is said to overcome difficulties encountered previously in attempts to make water dispersions of the polyamides.

The new suspensoids are described as cationic and remarkably stable, and are claimed not to coagulate even when repeatedly frozen and thawed. They are heat-sealing and adhere firmly to most materials, according to the makers, and will fuse to become resistant to water, water-vapor, and oil. They are said to dry rapidly and will not block even under severe pressure. The suspensoids are reported available in two grades, one an essentially uncompounded suspensoid and the other modified for superior abrasion-resistance and for producing heat-seal bonds with improved stability at low temperatures.

New Collection of Reports On Utilization of Wood

A comprehensive collection of reports on wood utilization is reported available from the government. The collection is said to include 24 presentations dealing with wood research by the armed forces; the mechanisms of wood lignification and deterioration; utilization of wood for packaging; as a construction material in timber or "sandwich" form, and as conversion products; and wood requirements for aircraft, shipbuilding, and other fields. Some papers deal with fungus and insect problems, particularly with the marine borer.

Synthetic Albumen Process

A new Norwegian process for producing synthetic albumen from codfish waste has been announced. The product, claimed to contain 80 to 90 per cent pure protein reportedly can be used for baking, ice cream, mayonnaise, and pharmaceutical products, as well as in textile and paint industries.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

"Liquid sandpaper," a chemical compound to replace sanding of surfaces before refinishing, removes wax, grease, and polish from hardwood floors and painted and enameled surfaces with a single wiping, according to the makers. It reportedly dulls gloss and provides a flat undercoat. **(No. 609)**

To protect against solvent fires involving ether, esters, acetone, alcohol, and related solvents, a new foam charge effectively covers and snuffs out flames in seconds, insulating threatened areas and preventing flashbacks, the makers claim. **(No. 610)**

A new snap-on spout for paint cans is said to permit faster stirring of full paint cans without slopping over edge and to make pouring easier. Spout is a natural resting place for the wet brush. Easy to clean, it reportedly may be used over and over. **(No. 611)**

A new-type light filter is claimed to block dingy red and yellow light from the rays of incandescent light bulbs. The filter, attached to a magnifier which nearly doubles light intensity, can be turned to any position on the bulb to focus light as needed. **(No. 612)**

To permit closed bin tops and bin storage of materials previously considered impossible to feed from bins, a new pneumatic device is claimed to provide direct action on bin contents rather than the bin, positive extrusions, easy installation, vibrationless operation, safety, and economy. **(No. 613)**

A new combination bootable flask and separatory funnel may be used, it is reported, for weighing, drying, dissolving, mixing, concentrating, precipitating, cooling, heating, melting, boiling, distilling, evaporating, decanting, and crystallizing without need of transferring to other flasks. **(No. 614)**

A new antiseptic liquid hand soap, developed for the special use of food handlers and industrial workers, is said to contain hexachlorophene to help reduce bacterial flora on the skin and an emollient and skin-softener to help lessen certain skin irritations caused by frequent hand washing. **(No. 615)**

A new portable 85° glossmeter, specially designed for measuring the sheen of interior wall paints and camouflage paints, is on the market. **(No. 616)**

A new liquid accelerator, miscible with water, can be added directly to natural or synthetic latex, the makers state. Films vulcanized with it are described as having high tensile strength and good aging properties. **(No. 617)**

New laminated tubing for the chemical and oil processing industries, made of glass fibers bonded with resins, is said to have the strength of steel and to be rust- and corrosion-proof. **(No. 618)**

PRODUCTS OF U.S.I.

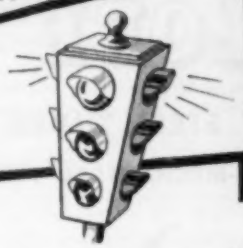
ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P.
Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous
ANTI-FREEZES
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze
AMIDES
Amsol* M
Amsol* PR
ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
Dioctyl Phthalate
OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate
INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.
ACETONE — A.C.S.
FEED PRODUCTS
Curbay B-G*
dl-Methionine
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Animal Protein Factor Supplement
Vacatone* 40
RESINS (Synthetic and Natural)
Arachem*—modified types
Arafene*—pure phenolics
Araflat—for special flat finishes
Araplas*—alkyds and allied materials
Congo Gums—raw, fused & esterified
Ester Gums—all types
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust
INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents
OTHER PRODUCTS
Collodions
Ethylene
Nitrocellulose Solutions
P.B.*—Liquid Insulation
Urethan, U.S.P.
Special Chemicals and Solvents

*Reg. U.S. Pat. Off.

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17 N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

STOP STREAM POLLUTION... *Automatically*



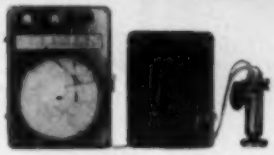
Bristol's pH Controller-Recorder puts plant waste neutralization on continuous, accurate, economical basis

If you are now neutralizing plant wastes manually —or are considering the installation of a neutralization system, a Bristol pH Controller-Recorder can standardize your results . . . prevent corrosion losses . . . utilize chemicals with maximum economy and safeguard stream and river purity.

A typical installation involves:

- a Bristol pH Controller-Recorder which continuously measures the pH of plant wastes and controls the flow of reagents to the mixing chamber to achieve a neutral value —
- and a Bristol Recording Flow-Meter which measures the volume of material to be treated, records the variations in the rate of flow and totalizes flow for record and cost-figuring purposes.

These Bristol Instruments are carried in stock for immediate delivery. Write for further information. THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 91, Connecticut.



Bristol Continuous pH Controller-Recorder

TYPICAL UNIT CHEMICAL-PROCESS APPLICATIONS FOR BRISTOL pH INSTRUMENTS

Neutralization . . . to show when reagents have carried reaction to desired pH value.

Coagulation . . . to indicate when optimum pH value is attained.

Precipitation . . . to insure complete precipitation and proper physical properties of precipitate.

Fermentation . . . to insure that material remains within the critical pH range for maximum action.

Electro-deposition . . . proper pH determines efficiency of base metal plating.

Other Applications . . . crystallization . . . absorption . . . filtering . . . bleaching . . . settling. *Write for facts.*

Bristol makes a complete line of instruments for controlling sewage and industrial waste disposal processes, including recording thermometers, liquid level instruments, flowmeters, pH instruments, recording gauges, pyrometers, telemetering instruments, and automatic controllers.

BRISTOL

Engineers process control for better products and profits

AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS

- Sizes ½ to 6¾ inches O.D.
- Wall Thickness .083 to 1.000 inches.
- Analyses—To Meet Conditions Where Heat, Corrosion, Pressure and Structural Strength are Involved.

Do the job best with the best tubing for the job—get

GLOBE

ALLOY STEEL TUBES

SEAMLESS—MECHANICAL—PRESSURE

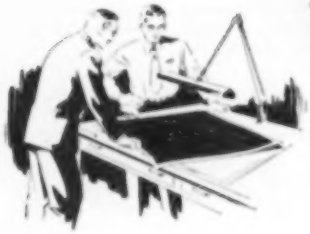
TYPICAL ANALYSES:

- Carbon Moly
- 1¼% Chrome ½% Moly .50/1.00
- 1¾% Chrome .60/.80 Moly
- 2% Chrome ½% Moly
- 2¼% Chrome .90/1.00% Moly
- 4/6% Chrome ½% Moly
- 6-8% Chrome ½% Moly
- 7-9% Chrome ½% Moly
- SAE 1335
- SAE 2300
- SAE 2512
- SAE 4130; SAE 4140
- SAE 4615
- SAE 8615, 8617 Fine Grain
- SAE 8620; 8630; 8635; 8640
- 5% Ni.
- 9% Ni.

TYPICAL APPLICATIONS:

- Superheat Tubes
- Pressure Tubes
- Still Tubes
- Mechanical Tubes
- Condenser Tubes
- Barrel Tubes
- Pump Barrels — Oil Well
- Evaporator Tubes
- Aircraft Tubes
- Propellers
- Rollers for Transmission Chains
- Oil Well Tubing

GLOBE TUBES



Globe engineers gladly give you the benefit of specialized knowledge and experience on the application of steel tubing in a wide range of services — mechanical — pressure — corrosion resistant.

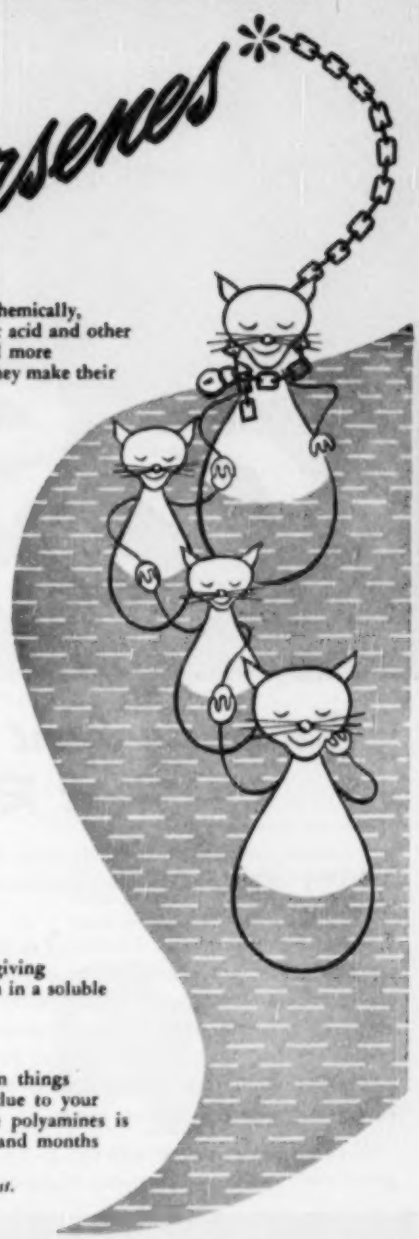
GLOBE STEEL TUBES CO., Milwaukee 4, Wis.

Chicago - Minneapolis - Cleveland - Detroit - New York - Philadelphia St. Louis - Tulsa - Houston - Denver - San Francisco - Glendale, Calif.

Producers of Globe Seamless Stainless Steel Tubes — Gloweld Welded Stainless Steel Tubes — Carbon-Alloy-Seamless Steel Tubes — Globeiron Seamless High Purity Ingot Iron Tubes — Globe Welding Fittings.

how to control cations in solution...

THE *Versenes*



WHAT THEY ARE

The Versenes are powerful organic complexing agents. Chemically, they are the sodium salts of ethylene diamine tetra acetic acid and other polyamino acids in liquid or powdered form. More and more process industries are taking advantage of them because they make their processes and products better at far less cost.

WHAT THEY DO

The Versenes® are extremely versatile and stable at high temperatures. Here are some of the things they do:

- *Soften water* without *precipitation.*
- *Complex ferric iron in up to 40% caustic solution.*
- *Prevent uneven and spotty dyeing of textiles.*
- *Inactivate* divalent *metals such as cobalt, copper, nickel.*
- *Inactivate* trivalent *iron, calcium, magnesium and other metallic salts.*
- *Remove hardwater deposits and precipitates.*
- *Dissolve grease and food deposits.*
- *Clarify liquid soap solutions.*
- *Prevent oxidation of fats, oils, soaps, fatty acids, organic materials.*
- *Stop reactions catalyzed by metallic ions.*
- *Aid in purification of materials.*
- *Separate metals from each other.*
- *Reduce activity of metal ions.*
- *Purify drugs.*
- *Stabilize color and maintain flexibility in plastics.*
- *Lower viscosity of starch and glue solutions.*
- *Provide an analytical reagent in Schwartzenbach method of water analysis.*

HOW THEY DO IT

The Versenes® do any or all of these things for you by giving you exacting chemical control of cations — keeping them in a soluble complex form.

WHAT TO DO ABOUT IT

Each Versene has a special application and does certain things better than others. This is why you should give us a clue to your problem. A generation of experience in pioneering the polyamines is yours for the asking. It can save you days and weeks and months of research

Send for Technical Bulletin #2. Samples on request.

®Trade Mark

BERSWORTH CHEMICAL COMPANY

FRAMINGHAM, MASSACHUSETTS

WAREHOUSE STOCKS

W. Coast Agent: Griffin Chemical Co., San Francisco, Los Angeles Chicago Agent: Kraft Chemical Co., Inc., 917 W 18th St., Chicago

Wasatch Chemical Co., Salt Lake City, Utah Berado & Pago, Inc., Dallas and Houston, Texas

GARLOCK PACKINGS and GASKETS

made of *Teflon*

Extremely Inert to Chemicals; Heat Resistant; Tough; Durable

GARLOCK packings and gaskets made of *Teflon* solve the problem of sealing against acids and chemicals of all kinds.

These *Teflon* products, fabricated in the GARLOCK factories, are unaffected by any acid and are highly resistant to all organic solvents and alkalies. They operate at temperatures from below −90° F. up to +500° F. and have high mechanical strength and a low coefficient of friction within that temperature range.

For use on valves, pump rods or shafts and any other equipment in the chemical industry, GARLOCK produces several types of braided and molded *Teflon* packings. For gasketing flanged joints of all kinds, including glass and porcelain flanges, *Teflon* envelope gaskets or solid *Teflon* gaskets are available in required sizes and shapes.

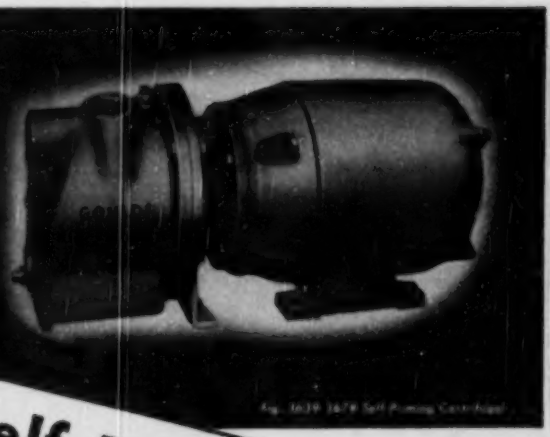
To avoid frequent shut-downs and reduce your packing costs, use GARLOCK packings and gaskets made of *Teflon* on all your equipment handling acids or chemicals. *Write for pamphlet.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK

HERE IT IS!



Goulds NEW Self-Priming Pump

Only GOULDS gives you all five of these outstanding advantages

1. Absolutely no valves of any kind in pump—nor are any needed in installation. Liquid can drain out of discharge and suction line through pump without affecting priming ability.
2. No recirculation of liquid after completion of priming action.
3. Efficiencies comparable to quality straight centrifugal pumps are thus obtained.
4. Positive fast-acting self-priming similar to priming ability of positive displacement pumps.
5. No large or bulky priming chambers or reservoirs, providing a compact unit at low cost.

APPLICATIONS:

Any service where suction lifts are encountered. Particularly adaptable for automatic service or where liquids to be pumped contain air or gas. Pump will automatically free itself of air and positively will not vapor lock.

Open impeller type. Sump service • Sewage effluent • Marine-bilge pumping, etc. • Mine gathering and dewatering • Dewatering excavations, cellars, etc.

Enclosed impeller type. Cold and hot water • Low pressure fire service • Pumping from underground supply • Irrigation • Sprinkling • Engine jacket cooling water service • Volatile liquids and light oils • Ice core sucking.

SIZES—CAPACITIES AND OTHER FEATURES

39 Models and Sizes

¼ to 5 H.P. ratings

Open and enclosed impellers

Capacities to 120 G.P.M.

Heads to 135 ft. depending on capacities

Suction lifts to 25 ft.

Also available in Flexible coupling motor drive or belt drive and close-coupld gasoline engine-driven unit.

Fig. 3739-3789 Flexible coupling type drive

Patents Pending

FOR FULL DETAILS WRITE FOR BULLETIN 636.1

MEMBER

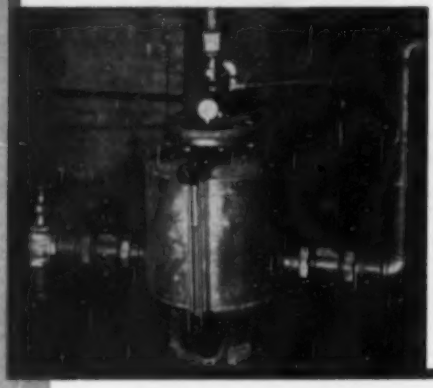
Goulds PUMPS INC. Seneca Falls New York

PENBERTHY PRODUCTS THAT improve PROCESS AND PLANT

PENBERTHY REFLEX LIQUID LEVEL GAGES

You can't misread the Penberthy Reflex Liquid Level Gage . . . it prevents mistakes. Due to a simple, invariable optical principle, the empty space always shows white . . . the liquid black. In addition to standard units, Penberthy Reflex Gages are fabricated to customers' specifications from special alloys to meet unusual corrosive, pressure and temperature conditions. Write for new Catalog No. 35.

PENBERTHY CYCLING JET PUMPS



Operated by air, gas, or steam pressure, pumps (without clogging) any liquid that will flow through pipes. Lifts fluid from lower level and discharges against pressure approximately equal to operating gas pressure. Operates automatically by ejector that exhausts the vessel . . . drawing in liquid . . . then gas pressure pushes it out. Ejector and its control valve not in contact with fluid pumped. Corrosion proofing easy. Write for Bulletin 5030.

PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Has no moving parts . . . needs no lubrication. Will not get out of order . . . wear is not appreciable. Reliable, noiseless, compact, convenient and initial cost is very low. Made in bronze, iron and wide variety of materials that successfully withstand corrosion, contamination and high temperatures. Special units developed to meet unusual conditions. Write for Catalog 34.

PENBERTHY *Explosion Proof* SUMP PUMPS

Motor and switch totally enclosed, this pump has Underwriters approval for Class I, Group D, and Class II, Groups E, F and G hazardous locations. These include gasoline, solvent vapors, metal dust, natural gas, carbon black, naphtha, alcohol, grain dust, acetone, lacquer, coal and coke dust, etc. Made of copper and bronze throughout, this pump is corrosion proof, durable, thoroughly dependable. Write for Bulletin 4529.

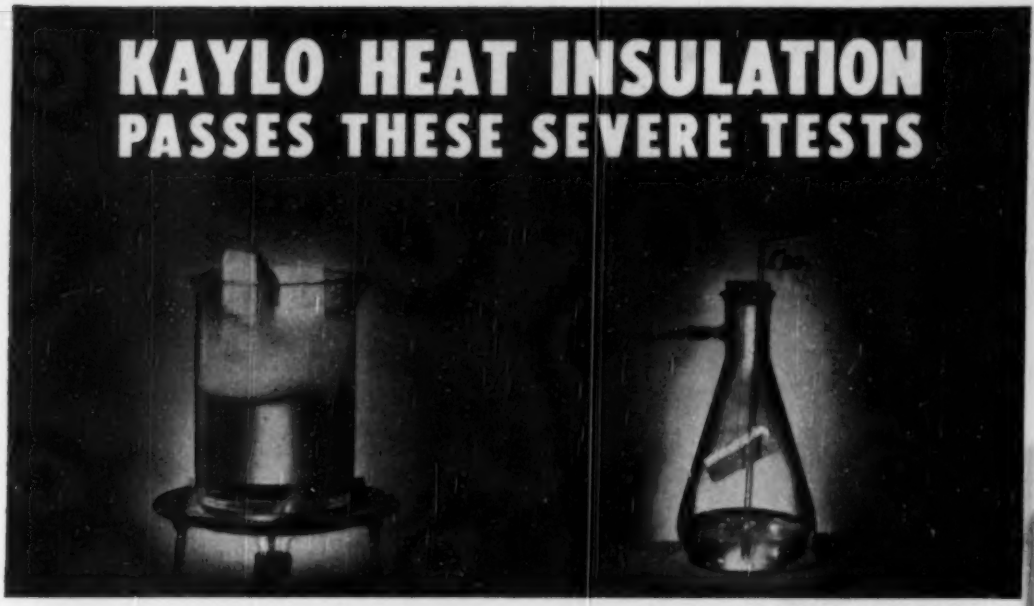
PENBERTHY ALSO MANUFACTURES A COMPLETE LINE OF LIQUID LEVEL GAGES IN BRONZE, IRON, STEEL AND ALLOYS

PENBERTHY INJECTOR COMPANY

DETROIT 2, MICHIGAN

Established 1886 *Canadian Plant, Windsor, Ontario*

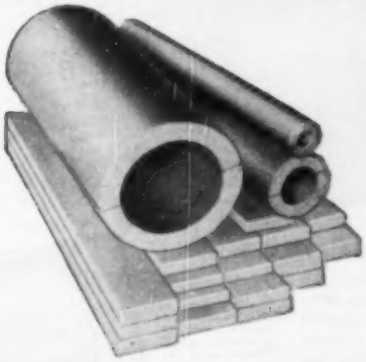
KAYLO HEAT INSULATION
PASSES THESE SEVERE TESTS



BOILING TEST: Samples of Kaylo Heat Insulation have been boiled continuously for 24 hours and longer. None disintegrated or showed any loss of insulating efficiency after drying.

FUME TEST: Samples of Kaylo Heat Insulation were suspended in an aerated mixture of water vapor and SO_2. The Kaylo samples showed no deterioration after weeks of direct exposure.

One Material Insulates Efficiently up to 1200°F.



Kaylo Heat Insulation is made of hydrous calcium silicate (not glass), a remarkable material with high insulating efficiency up to 1200°F. This new type of inorganic insulating material retains its stability in long service under severe conditions. Exceptional strength and lighter weight make it easier to handle and apply.

KAYLO PIPE INSULATION is produced in Simplified Dimensional Standards of thicknesses and diameters for pipe sizes from ½" to 72". Coverings are sectional for sizes ½" to 12"; tri-segmental for 8" to 23"; quad-segmental for 19" to 41"; K-segmental (18" sections) for 38" to 72". O.D.'s of insulation correspond to O.D.'s of standard pipes.

KAYLO HEAT INSULATING BLOCK is available for single layer application in thicknesses from 1" to 6". It is made in all standard sizes up to 18" x 36".

KAYLO®

PIPE INSULATION AND HEAT INSULATING BLOCK

OWENS-ILLINOIS GLASS COMPANY
Kaylo Division • Toledo 1, Ohio

SALES OFFICES:
Atlanta · Boston · Buffalo · Chicago · Cincinnati · Houston · Minneapolis · New York
Oklahoma City · Philadelphia · Pittsburgh · St. Louis · Toledo · Washington

SEND COUPON FOR KAYLO HEAT INSULATION LITERATURE

OWENS-ILLINOIS GLASS COMPANY
Dept. N-67, Kaylo Division • Toledo 1, Ohio

Gentlemen: Please send me descriptive literature on Kaylo Heat Insulation.

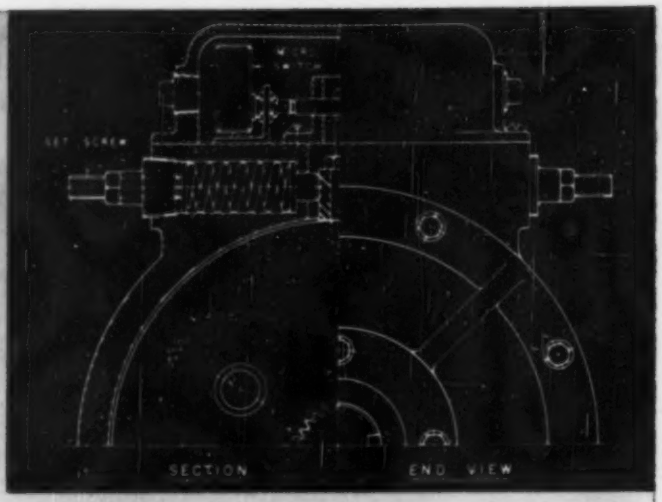
NAME.....

FIRM.....

ADDRESS.....

CITY.....STATE.....

Positive Protection from OVERLOAD DAMAGE



PHILADELPHIA PLANETORQUE MOTOREDUCER

CUTS OFF MOTOR CURRENT INSTANTLY AND AUTOMATICALLY

. . . when the load reaches a predetermined value, thus protecting both the driven machinery and the drive unit from overloads. This feature can be provided on any MotoReduceR . . . either vertical or horizontal types. On removal of the excessive load the PlaneTorque MotoReduceR may be started without resetting the switch. Incidentally, the PlaneTorque can be cut out during the starting period, by merely holding down the starting button; upon release PlaneTorque is again operative. The PlaneTorque is ideal for Stoker drives, Conveyors, Crushers, Mixers, Rolls, Pulverizers and a "hundred and one" other machines. MotoReduceRs are available in all required Horsepowers and Reduction Ratios. Efficiencies are as high as 97%.

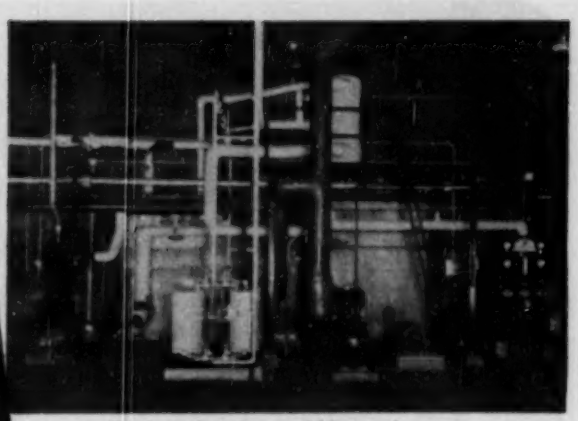
For full information about Philadelphia MotoReduceRs and the PlaneTorque feature, send for Bulletin M849. Please write on your Business Letterhead.

Philadelphia Gear Works, INC.

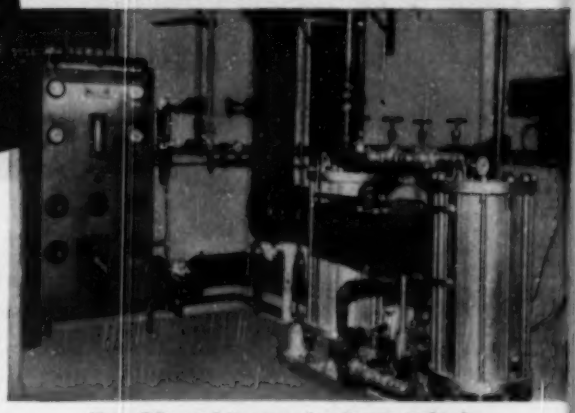
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

No Dewpoint TO LIMIT OF TEST EQUIPMENT at minus 82°F.



This Lectrodryer in a world-famous brewery has been in constant service over 10 years.



Here, CO_2 used to pressurize storage tanks, is dried by this Lectrodryer before being recirculated.

CO_2 RECYCLING SYSTEM PREVENTS FREEZE-UPS WITH LECTRODRYERS

Moisture in carbon dioxide entering the liquefication train causes trouble, where temperatures run between minus 10° to 20°F. Frost forms on surfaces of the heat exchanger, causing it to become inoperative.

The Witteman Company of Buffalo headed off that trouble by including a Lectrodryer in their CO_2 recycling systems shown above.

Whether you're handling air, gases or organic liquids—or if working or storage areas must be held at low dewpoints to prevent spoilage of materials—there's a Lectrodryer to handle the job. Our engineers will help select the machine you need.

Write, telling your DRYing problem to Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U. S. PAT. OFF.

DO YOU WANT THE FACTS?

ABOUT EFFICIENT INSULATED PIPING SYSTEMS

Chemical and processing engineers as well as those responsible for operation and maintenance of industrial plants of all types will welcome the complete descriptive technical information available in the series of catalogs and data books recently published on Ric-wiL Prefabricated Insulated Piping Systems.

Publication of these books is in keeping with the Ric-wiL policy established forty years ago of providing not only the finest insulated piping and accessories but also complete technical information for users of Ric-wiL products.

There are five books in the series, each of which deals with specific phases of insulated piping design, engineering, and installation.

Section 480-2—Engineering Data—A comprehensive data book containing pertinent engineering data as applied to insulated piping and steam distribution.

Section 480-3—Typical Engineering Drawing—Consists of a series of typical engineering drawings for insulated piping.

Section 480-4—Insulated Piping Systems Catalog—Contains pertinent general information about Ric-wiL Prefabricated Systems, with many illustrations of the products, their dimensions, installation, and other valuable data.

Section 480-4A—Ric-wil Tile and Cast Iron Conduit Catalog—Contains complete illustrated and descriptive material dealing specifically with Sectional Tile and Cast Iron conduits, their applications and specifications.

Section 480-5—Specification Data—This book contains specifications for all types of insulated piping and installation procedures.

Copies of any of the described books are available. Write to Dept. 7-X, The Ric-wiL Company, Cleveland, Ohio.

40th YEAR DEPENDABLE INSULATED PIPING SYSTEMS 1910 1950

RIC-WIL
INSULATED PIPING SYSTEMS

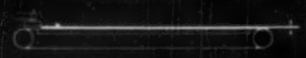
OVERHEAD — THE RIC-WIL COMPANY · CLEVELAND, O. — UNDERGROUND

FOR FORTY YEARS THE GREATEST NAME IN INSULATED PIPING SYSTEMS

Some of the Functions that have been successfully performed by Sandvik Conveyors

WITH A SANDVIK WATER-BED CONVEYOR YOU CAN

COOL AND CONVEY



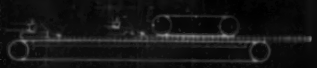
REGULATE THICKNESS WHILE COOLING ANY THICKNESS UP TO 1 CAN BE COOLED

CUT MATERIAL TO DESIRED SIZES WHILE COOLING

COOL AND STRIP OFF GELATINOUS MATERIALS IN SHEET FORM

COOL LOOSE AND PULVERIZED MATERIALS

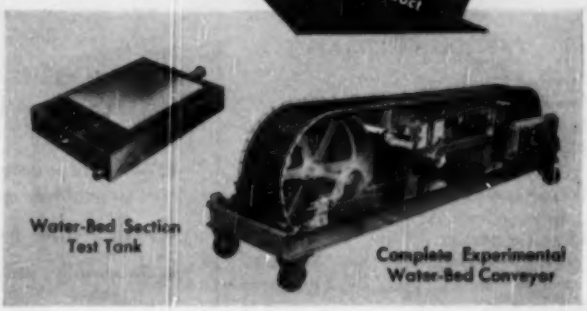
COOL SOLIDS IN SHEET FORM



COOL MATERIAL IN LAYERS

HOW CAN SANDVIK'S NEW COOLING CONVEYOR *Improve YOUR production?*

HERE ARE TWO WAYS To "Pre-Test" Sandvik's Steel-Belt, Water-Bed Conveyor With Your Own Product



Water-Bed Section Test Tank

Complete Experimental Water-Bed Conveyor

With one of these experimental units you can find out how Sandvik's patented water-bed conveyor can make your processing more automatic.

A small scale trial in your plant will enable you to determine cooling rates and other pertinent data. You will see for yourself the extraordinary cooling capacity of this conveyor combined with the advantages of the steel belt.

How The Water-Bed Conveyor Operates—**The loaded steel band "floats" along on an open trough of circulating water. The water pressure assures 100% coolant contact with the belt. The trough is so designed that no water can get on top of the belt.**

Experimental water-bed units are available on request. Sandvik's engineering department will help you decide which test unit is best suited for your purpose. Write, wire or 'phone for complete details.

SANDVIK STEEL, INC.

Conveyor Department

111 Eighth Ave., New York 11, N. Y.
WAtkins 9-7180

Manufacturers of Steel-Belt Conveyors For Over 30 Years

SANDVIK STEEL BELT CONVEYORS

55-64

INCONEL

INCONEL

At home in 2200 degree heat or protecting delicate Chloromycetin . . . this modern high-Nickel alloy solves many of industry's most troublesome metal problems.

NOMINAL CHEMICAL COMPOSITION
(Wrought)

Nickel	77.
Chromium	15.
Iron	7.
Manganese	0.25
Copper	0.2
Silicon	0.25
Carbon	0.06
Sulfur	0.007

PHYSICAL CONSTANTS

Density, lb./cu. in.	0.307
Melting Range	2540°—2600°F.
Specific Heat (77°—212°F.)	0.109
Thermal Expansion Coefficient in./in. (100°—200°F.)	0.0000064
Thermal Conductivity (100°—212°F.) Btu/sq. ft./hr.°F./in.	104
Modulus of Elasticity in tension and compression, psi	31,000,000
In torsion, psi	11,000,000
Poisson's Ratio	0.29

MECHANICAL PROPERTIES

Figures shown are for standard cold-rolled sheet, hard. Variations will occur for different forms and tempers.

Tensile Strength	125,000 to 150,000 psi
Yield Strength (0.20% offset)	90,000 to 123,000 psi
Elongation in 2 in.	15% to 2%
Rockwell C. hardness	25 to 29

FORMS

Wire	Bar	Plate	Pipe
Rod	Angles	Sheet	Strip

Seamless and welded tubing

Sand and precision castings

Clad-Steel Plate and Strip — Welding Rods

Combining remarkable thermal durability, corrosion-resistance and strength ... Inconel* is unique among metals.

Inconel is a thoroughly *practical* metal: workable, economical, readily available in many convenient forms.

Inconel ... and only Inconel ... brings you *all* these desirable properties in a single alloy:

- **Unusually high resistance to chemical corrosives, both hot and cold, such as fatty and other organic acids, caustic alkalis at high temperatures, hot alkaline sulfides and strong chloride solutions.**
- **Exceptional stability in the presence of food acids, cultures, ferments, alcoholic beverages — minimizing the danger of harmful metallic contamination.**
- **Ability to withstand constant temperatures of up to 2200° F., in sulphur-free atmosphere.**
- **High strength, both hot and cold.**
- **Good spring properties, especially valuable in high-heat applications.**
- **Good workability ... can be machined, cast, forged, formed ... can be joined by welding, brazing, or soldering. Welded joints are as corrosion and heat-resistant as the alloy itself. Inconel is also available in the form of clad-steel.**

Next time you have a high-heat or corrosion problem ... try Inconel.

Inco's Technical Service Department will gladly make design and fabrication recommendations.

For a valuable addition to your reference files, write for Bulletin T-7, *Engineering Properties of Inconel.*

*Reg. U. S. Pat. Off.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Engineered and installed by Gifford-Wood at a large Eastern brewery, this system handles corn, rice and malt from railroad cars at the rate of 2000 bu. per hour. It conveys materials to storage, whence it is removed by trucks to the brewhouse as needed. The entire unloading area is shed-enclosed for protection against the weather.

only through *Engineering*.. ..can efficiency be achieved

Economical, efficient **materials handling** is never a matter of luck. Each system must result from careful analysis of individual needs, must be developed only after every phase of the problem at hand has been thoroughly studied.

Gifford-Wood has been engineering materials handling systems for more than a century. Over these years, tremendous practical experience in the development of **materials handling systems** for every industry has been built up.

It enables G-W Engineers to go straight to the heart of your handling problem, to make recommendations based not on theory but on thorough understanding of your specific needs. It enables them to design for maximum economy by keeping operating and maintenance costs at the minimum.

To call upon **G-W Materials Handling Engineers** to survey your present methods of handling materials places you under no obligation. It may well prove to be a step toward higher profits through lower operating and maintenance costs.

When You Think of Materials Handling—Think of **GIFFORD-WOOD CO.**

Since 1814 HUDSON, NEW YORK

NEW YORK 17, N. Y. 420 LEXINGTON AVE. | ST. LOUIS 1, MO. RAILWAY EXCHANGE BLDG. | CHICAGO 6, ILL. 565 W. WASHINGTON ST.

TLTT

Need special high pressure gaskets such as these?

Flare-type Gasket with Bellows Action

Delta Joint Gasket

Pressure Seal Joint Gasket

We tailor them to your specifications

If you require high pressure gaskets made to extremely close tolerances—for service exceeding 10,000 psi, for example—and fabricated to any desired diameter or cross-section, why not look into the special service that Goetze offers for making these gaskets to your order.

The gaskets shown above are typical of the wide variety for high pressure service that have been made to order for Goetze customers. The flare type gasket with bellows action illustrated at upper right is but one example of what Goetze "know-how" can accomplish.

Goetze has had over sixty years of experience in making specialized metallic gaskets for industry's most complex jobs. Modern machines—many of them specially designed and built by Goetze—enable Goetze craftsmen to produce gaskets of any required design, shape or size... and deliver them with remarkable promptness.

For further information about Johns-Manville Goetze gaskets, write for a copy of the new Goetze Gasket Catalog. Or send us a drawing or template for assistance on your specific problem. Address Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville Goetze GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE.

There was trouble at the centrifuges. Not that they weren't efficient... they just could not handle the excessive loads of the coarse foots in the oil being processed.

It was in a fish plant on the East Coast. Inedible menhaden was being converted into rich animal-feed and commercially-useful oils. With the existing process, the maximum productive capacity of the plant could not be attained. When the centrifuges were overloaded, output dropped—and with it went deliveries and profits.

Two Hewitt-Robins Hydrex® Screens were installed, one above the other. The upper Hydrex, with 60-mesh deck, takes out the meal. The lower Hydrex, with 100-mesh deck, removes the coarse foot from the oil, passing the lightened effluent to the centrifuges for final clarification.

Production is now on a *continuous* basis of 4000 gallons every hour fed to the upper unit. Salable meal and clear oil come from that plant on a production-line basis.

Perhaps you face a problem that can be solved, as was this one, by a new approach to processing *methods*. One or more Hewitt-Robins Hydrex Screens might improve your operations in any of several phases—saving solids from liquids, liquids from solids or removing fines from coarser materials. A detailed explanation of your problem will result in specific recommendations for its solution. Address Robins Conveyors Division, Hewitt-Robins Inc., 270 Passaic Avenue, Passaic, New Jersey.

HEWITT-ROBINS
HYDREX SCREENS

HEWITT-ROBINS HR **INCORPORATED**

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

. . . gives Kidde Dry Chemical Fire Extinguisher a 44% margin of safety!

The Factory Mutual Laboratories require that a 20 pound dry chemical fire extinguisher effectively cover 25 square feet of burning area . . . but the *Kidde* 20 pounder blanketed 36 square feet . . . *gave 44% extra coverage, extra safety!*

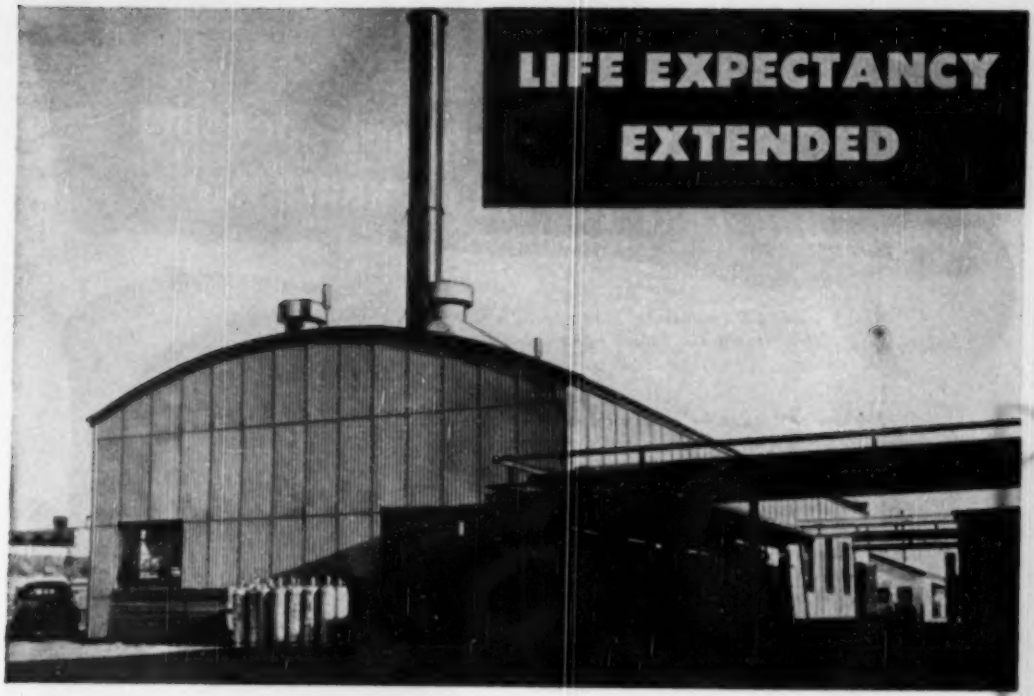
Kidde Dry Chemical Fire Extinguishers are quick and sure for fires in flammable liquids, live electrical equipment and for textiles. *Kidde* Trigger-Finger Control lets you just pick up extinguisher, point the horn and pull the trigger. *Kidde* streamlined diffuser horn gives you improved, cloud-like discharge pattern, greater coverage, and a heat-insulating blanket to guard the operator. The dry chemical absorbs heat, smothers flames, reaches corners, cracks, crevices. When these *Kidde* units go on, flames go out.

Kidde Dry Chemical Fire Extinguishers in 20 and 30 lb. units, are built to last, easy to use, simple to recharge . . . and give you a big margin of safety. Use the right kind of extinguisher for the right kind of fire—use *Kidde*.

Kidde

Walter Kidde & Company, 1028 Main St., Belleville 9, N. J.

In Canada: Walter Kidde & Company, Ltd., Montreal, P. Q.



by K&M "Century"® ASBESTOS CORRUGATED

Compressor Room of the Birds Eye-Snider Plant at Walla Walla, Washington, is sided with K&M "Century" Asbestos Corrugated Sheets.

The sturdy "clean build" of these compressor plant walls is one sign they'll live long. They're K&M "Century" Asbestos Corrugated, the material you see on more and more industrial and commercial buildings whose owners have made sure of lasting good looks and economy.

K&M Corrugated saves from the start by simplifying and speeding erection. Cutting, drilling, fitting and anchoring are easily done, with every assurance of trim, durable enclosure. What's more, K&M Asbestos Corrugated Sheets—*stay put*. They don't give in to weather effects and fire hazard, nor to rust, rot, rodents and termites. Thus long-term freedom from maintenance goes right along with the initial economy of using K&M "Century" Asbestos Corrugated for siding and for roofs, too.

Whatever your building plans, see how much this adaptable modern material can save you. Write us for full data and the name of your nearest K&M Distributor.

Even scaffolds and extra labor are eliminated when "TOP-SIDE"* fasteners are used. They are made for use with steel members of any type, on sides and roofs.
* ® H. & B. Enterprise Corp.

Nature made Asbestos... Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

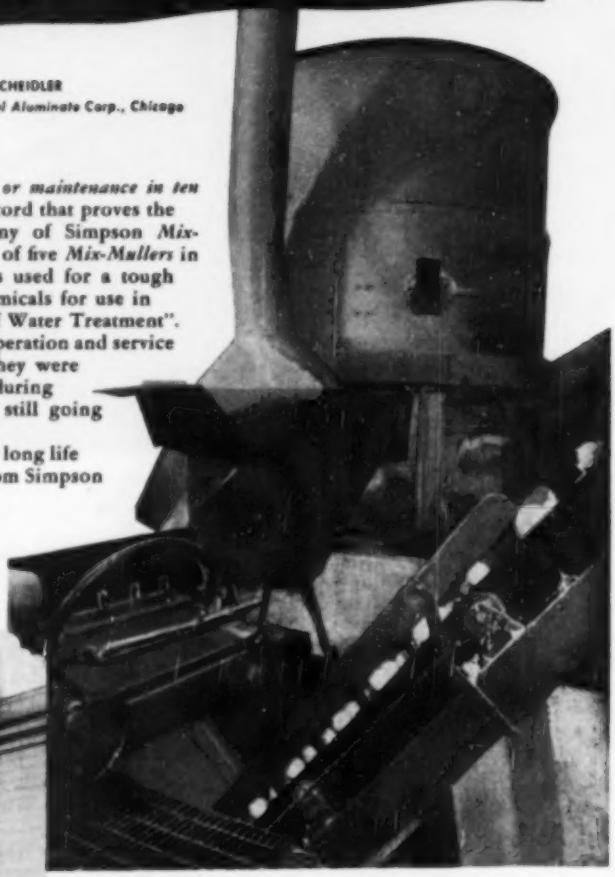
"we've used this SIMPSON MIX-MULLER for TEN YEARS without spending *one cent* for maintenance . . ."

. . *says:* LAWRENCE SCHEIDLER
Plant Superintendent, National Aluminate Corp., Chicago

Not one cent spent for repairs or maintenance in ten years . . . There's an operating record that proves the long-term efficiency and economy of Simpson *Mix-Mullers*. This particular unit, one of five *Mix-Mullers* in service at National Aluminate, is used for a tough mixing problem in blending chemicals for use in the well-known "Nalco System of Water Treatment".

In addition to the "normal" operation and service expected of these Mix-Mullers, they were operated for nine hours a day all during World War II . . . and they are still going strong.

This is but one example of the long life and low upkeep you can expect from Simpson *Mix-Mullers*, on all types of chemical-process mixing problems. Get the full story today—*write for a copy of our latest 8-page catalog.*



ABOVE: One of the five Simpson *Mix-Mullers* installed at National Aluminate. Note unit is completely hooded for dust suppression.
LEFT: This modern building houses the Nalco offices and laboratories.

SIMPSON *Mix-Muller*® *Division*

NATIONAL ENGINEERING CO., 604 Machinery Hall Bldg., Chicago 6, Ill.

Manufacturers and Selling Agents for Continental European Countries—George Fischer Limited, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia.

When you're looking for

LEAD LININGS

to take the "bite" out of corrosive chemicals

If your processing operations involve the handling of corrosive chemicals... you'll want tank linings of lead. Why? Because lead is the *able* metal. It not only is *able* to resist corrosion, but is also adapt*able*, work*able*, dur*able*, and salvage*able* after many, many years of service.

National Lead sheet with this unique combination of abilities is available in these grades: *chemical*, "standard" for most uses; *tellurium*, for increased corrosion resistance and strength at high temperatures; *antimonial*, for strength, stiffness and hardness; *tellurium-antimonial*, for extra hardness where erosion or cutting is a problem; *Nalco Metal*, a new lead alloy developed to give longer, better service in handling chromic acid solutions.

Basic metal for all these grades is "St. Joe chemical lead,"—produced from Southeast Missouri ores. This lead is universally recognized as best for handling chemicals.

When you need lead linings, buy National Lead sheet. For, as the leader in lead, National gives you the benefit of metal resources, mechanical equipment, and production know-how second to none. Plants in all principal cities.

...look to the Leader in Lead

...for everything from lead pipe...valves...sheet ...and lead-lined or lead-covered equipment...to a complete acid recovery plant

NATIONAL

LEAD COMPANY

New York 6; Atlanta; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Philadelphia 25; Pittsburgh 12; St. Louis 1; Boston 6 (National Lead Company of Mass.); Los Angeles 23 (Morris P. Kirk & Son, Inc.); Toronto, Canada (Canada Metal Co. Ltd.).

Trademarks Reg. U. S. Pat. Off.

It's the Nash!

Nash Compressors in your plant can automatically increase the capacity of your absorption equipment, for with the Nash it is possible to secure absorption directly in the pump.

This is due to the Nash liquid compressant operating principle, involving a fluid vortex through which the gas must pass in the process of compression. To absorb from a gas, simply flow absorbent through the compressor as the compressing medium. In this close contact of liquid and gas, the desired fractions are picked up and retained by the absorbent. This in no way impairs efficiency as a compressor.

This useful stunt is made possible by the fact that slugs of liquid entering a Nash Compressor do no harm to the pump structure. Nash pumps have only one internal moving part, simple, non-wearing, and employ no gas contaminating internal lubrication. There are no valves, gears, pistons, or sliding vanes, and original pump efficiency is maintained over a long life. In a single stage Nash Compressors produce 75 lbs. pressure or vacuums to 26 in. of mercury, with capacities up to 6 million cubic feet per day in a single structure. Investigate these pumps now.

One moving part.

No internal wearing parts.

No valves, pistons, or sliding vanes.

No internal lubrication.

Low maintenance.

Slugs of liquid entering pump do no harm.

Original performance constant over a long pump life.

Non-pulsating pressure.

Saves floor space.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

304 WILSON, SO. NORWALK, CONN.

Sparkler Horizontal Plate Filters

. . . have high flow rates

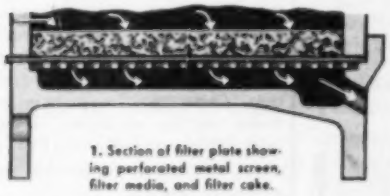
Frequently two to five times as high as the flow through filter septa lying in a different plane.

In Sparkler filters, friction encountered in high flow and high viscosity operations is reduced to a negligible factor by the free drainage and uniformity of cake provided only by Sparkler's horizontal plate construction. Less operating pressure is needed, with the result that the cake is less dense and thus offers less resistance to flow.

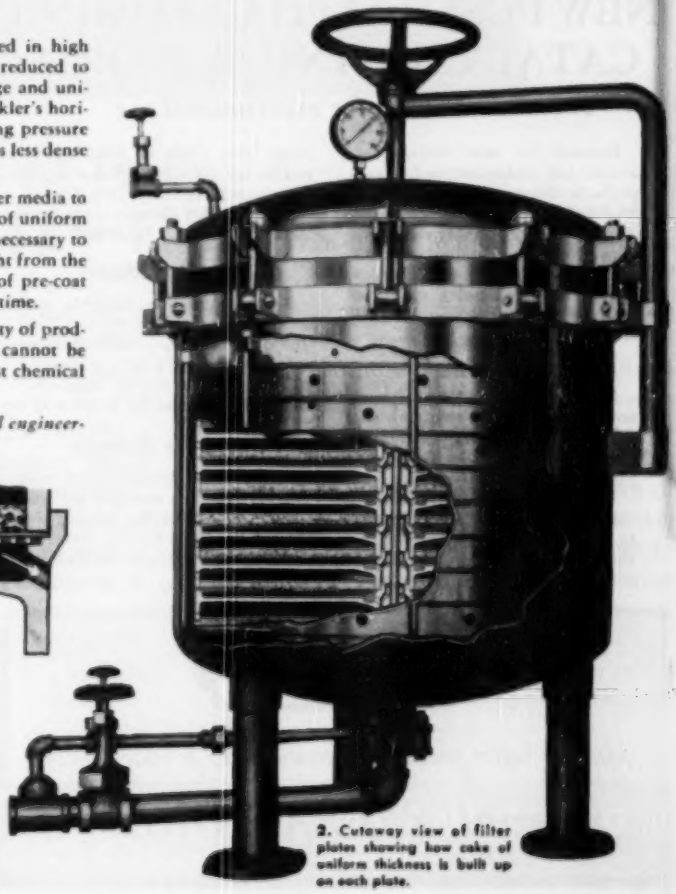
Sparkler horizontal plates permit filter media to be floated into position forming a cake of uniform thickness. Only a thin pre-coat cake is necessary to assure brilliant clarity of the filtrate right from the start. This means maximum economy of pre-coat material and precoating recirculating time.

For all out economy, speed and quality of product Sparkler Horizontal Plate Filters cannot be matched by other types in filtering most chemical products.

Write Mr. Eric Anderson for personal engineering service on your filtering problem.



1. Section of filter plate showing perforated metal screen, filter media, and filter cake.

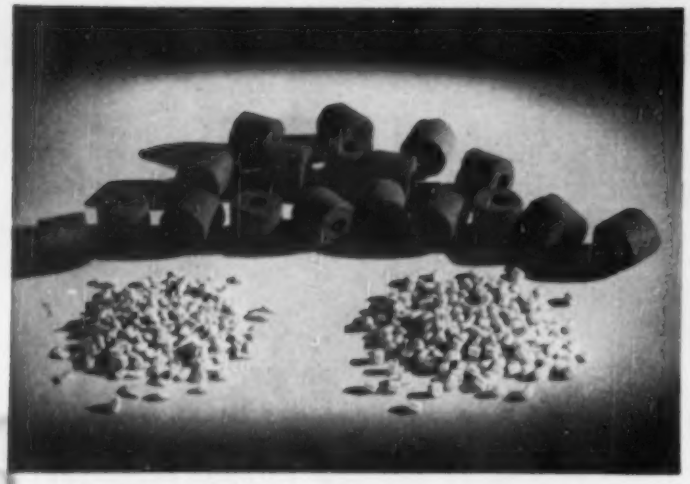


2. Cutaway view of filter plates showing how cake of uniform thickness is built up on each plate.

SPARKLER MANUFACTURING COMPANY

Mundelein, Ill.

Makers of filters for the Chemical, Pharmaceutical, Food and Petroleum Industries for over a quarter of a century.



Norton Alundum* catalysts and catalyst supports are available for experimental purposes in sphere, pellet and ring forms, sized to give you the surface area you need.

NEW FUSED ALPHA ALUMINA CATALYSTS AND SUPPORTS

. . . now available for experimental use

Demand for more uniform reactions and contamination-free end-products brings Norton Company into the catalyst field. Possessing more experience than anybody else in controlling the chemical and physical variables of fused alumina, Norton has developed a variety of catalysts and catalyst supports made of Alundum refractory grains.

Properties

Norton Alundum catalyst supports are made in five different mixtures varying from 77% to 89% alumina. Norton Alundum catalysts contain from 25 to 28% nickel oxide.

Water absorption values of both catalysts and supports vary from 12 to 22% by weight. *Surface areas* by the nitrogen absorption method range from 0.025 to 0.821 square meters per gram. *Crushing strengths* vary from 20 to 600 pounds depending on size. *Bulk densities* range from 60 to 80 pounds per cubic foot.

Sizes and Shapes

Norton Alundum catalysts and supports come *in spheres* — ¼" to ½" dia.; *in pellets* — 3/16" diameter x ¾" long to ¼" x ½"; *in rings* — 3/16" inside diameter x ¼" long x 3/8" outside diameter to 5/16" x ¾" x ¾".

Write for Samples

If you want to experiment with Norton Alundum catalysts and catalyst supports, write for samples. NORTON COMPANY, 500 New Bond Street, Worcester 6, Mass.

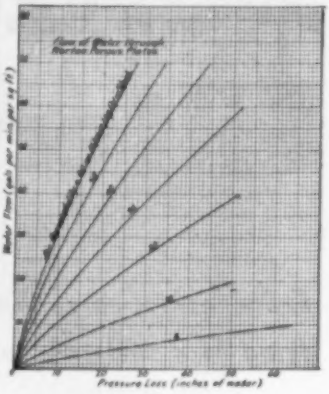
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Making better products to make other products better

Special REFRACTORIES

Up-To-The-Minute Facts About Fused Alumina Porous Mediums



THIS CHART, showing the flow of water and pressure loss through Norton porous plates of various permeabilities, is but one of many in a fact-packed bulletin on Norton Porous Mediums for commercial and laboratory processes. Write for BULLETIN 140.

WHETHER YOU FILTER liquors containing coarse crystalline or finely divided solids by gravity, vacuum or direct pressures, you owe it to yourself to investigate the possible use of Norton Alundum porous mediums.

You can get a quick picture of the amazing chemical stability, uniform permeability and great strength of Norton Alundum porous mediums by reading . . .

Bulletin 140

This 16-page report, by Norton engineers and researchers, gives you all the data you need to decide whether you can cut your filtering costs with Alundum porous mediums. *Tables* cover permeability, solubility data and strength tests. *Charts* visualize pressure losses under varying conditions. *Drawings* show you how to apply 12" x 12" x 1" plates and segments to tank bottoms of all sizes and shapes.

Investigate!

To get the foregoing data and much more, contact your nearby Norton representative or write direct for Bulletin 140.

NORTON COMPANY
500 NEW BOND STREET
WORCESTER 6, MASS.

These Meters Had To Be
ACCURATE—FLEXIBLE—RUGGED

One hundred twenty one Republic Pneumatic Transmitters are measuring the flow and level of various acids in a large chemical processing plant, a section of which is pictured above.

These transmitters have a guaranteed accuracy of within ½ of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0—0.6" of water to a maximum of 0—704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. It is for these reasons that Republic Pneumatic Transmitters, even though comparatively new, have already been specified and installed on over 2500 industrial metering applications.

Republic Pneumatic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Data Book No. 1001 contains complete details on the construction and operation of Republic Transmitters. Write for your copy today.

REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

What WE build we build good

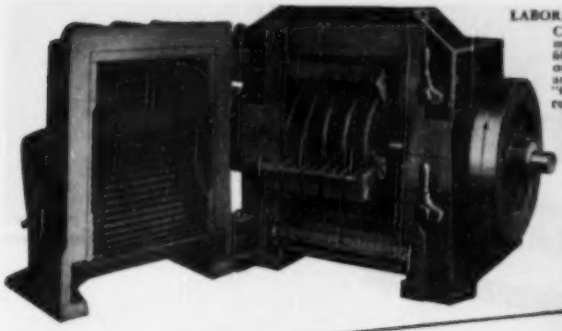
This is not a part of a ship or marine vessel, nor the nose of a huge torpedo. It is a section of a 55 foot diameter oil refining unit. It is being built in our plant where a large variety of similar equipment is built each year as regular products of this plant. Note the true shape and the accurate fits. Because of our vast facilities and long experience no job is too large and "what we build we build good."

Sun

SHIPBUILDING & DRY DOCK COMPANY

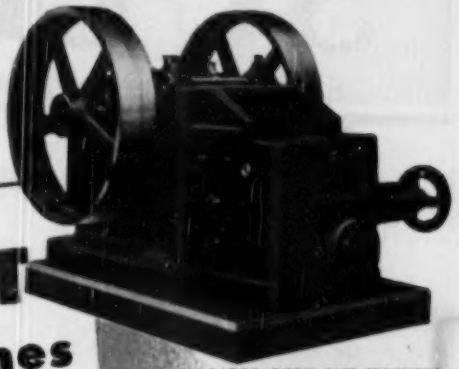
ON THE DELAWARE SINCE 1916 CHESTER, PENNA.

25 BROADWAY • NEW YORK CITY



LABORATORY SWING-SLEDGE MILLS

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



STURTEVANT

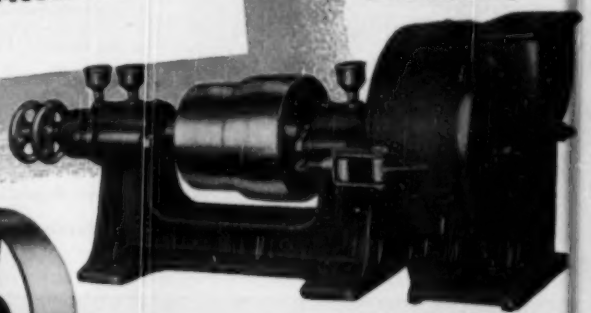
Laboratory Machines

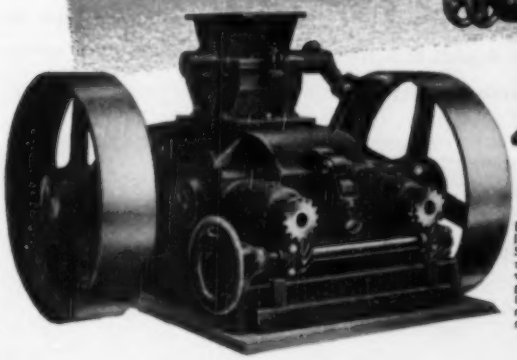
Assure Quality of Products

Fast - Economical - Accurate

LABORATORY JAW CRUSHERS

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

LABORATORY SAMPLE GRINDER

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

STURTEVANT MILL COMPANY

100 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MINING

The process of mining sulphur, as developed by Herman Frasch, takes advantage of the fairly low melting point of sulphur (about 240° Fahrenheit). The process resolves itself into three parts: one, operating a power plant that heats and pumps to the field large quantities of water; two, distributing the hot water through wells to melt the underground sulphur, and raising the melted sulphur to the surface; three, cooling and solidifying the sulphur in large vats from which it is broken and loaded into cars for shipment.

The power plant and water reservoir, as well as the vats and permanent structures, are placed at some distance from the sulphur deposit to avoid possibility of damage from surface subsidence, resulting from extraction of the underground sulphur.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

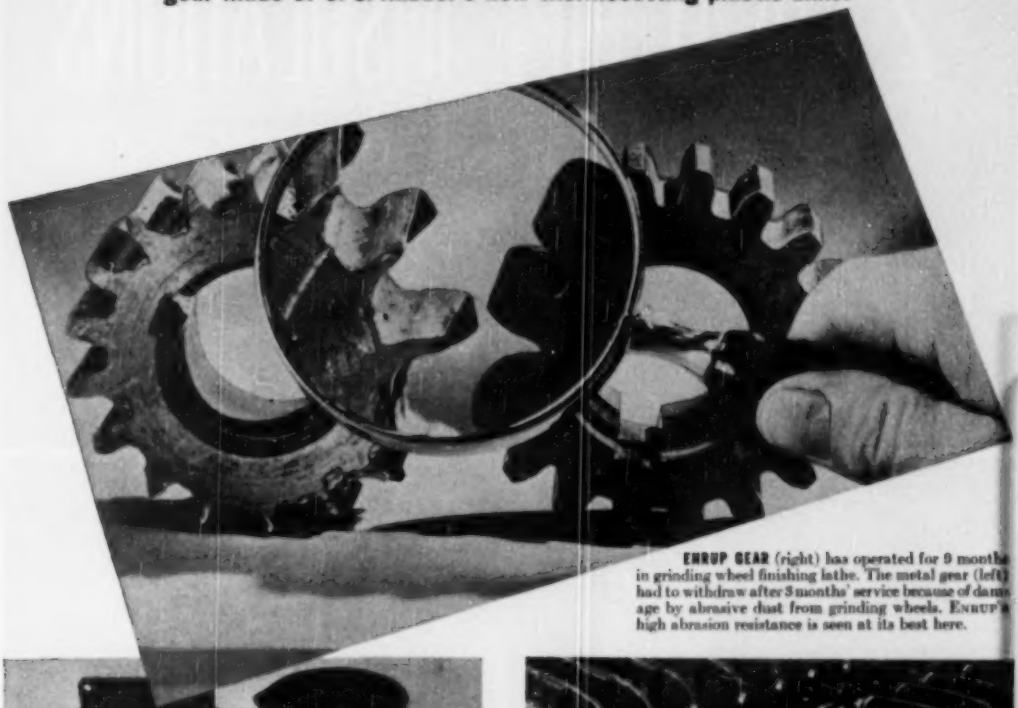
TEXAS GULF SULPHUR CO.
INC.

75 East 45th St. New York 17, N. Y.

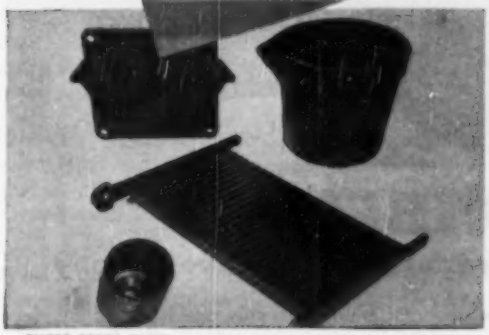
Mines: Newgulf and Moss Bluff, Texas

ONE GEAR BIT THE DUST, ONE DIDN'T

Abrasive dust makes short work of metal gear, has no effect on gear made of U. S. Rubber's new thermosetting plastic ENRUP



ENRUP GEAR (right) has operated for 9 months in grinding wheel finishing lathe. The metal gear (left) had to withdraw after 3 months' service because of damage by abrasive dust from grinding wheels. ENRUP's high abrasion resistance is seen at its best here.



FILTER PRESS PLATE, upper left, and chemical bucket, right, are molded from ENRUP replacing hard rubber because of toughness, heat and chemical resistance. Center is photostat separator plate, once made of hard rubber, now made of ENRUP because of superior toughness and high impact strength. Lower left is lap roll used in the textile industry. Once made of laminated phenolic, it is now molded out of ENRUP, cutting cost by 50%.

THESE COVERS for electroplating barrels were molded in one piece from ENRUP. Previous practice was to fabricate cover in sections from a thermoplastic material, then cement sections together. Molding cost has been cut more than 25 per cent. ENRUP can be punched, sawed, sanded, nailed, bolted, and machined. There is almost no end to its versatility.

ENRUP IS FABRICATED AND MOLDED ENTIRELY BY U. S. RUBBER ENGINEERS. Leading manufacturers select ENRUP to help make their products an outstanding success. ENRUP is about half the weight of aluminum, and is available in varying degrees of flexibility, ranging between that of elastic soft rubber on one hand, and hard rubber on the other. For more details on this remarkable plastic write to:

A DEVELOPMENT OF

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

2 GREAT PIPE INSULATIONS

Unibestos No. 750 - to 750°F.
Unibestos No. 1200 - to 1200°F.

Available in Cylinders or Half-rounds

UNIBESTOS®

. . . single-layer application saves money

When you can insulate a pipe efficiently with only one layer of covering, you save money. The range of thicknesses in which Unibestos Pipe Insulations are made permits the economies of single-layer application. Also a distinct saving in warehousing is made possible because fewer sizes of insulation are required in stock for maintenance work. But range of insulation thicknesses for single-layer application is only one of the many features of these 2 great pipe insulations—UNIBESTOS No. 750 and No. 1200. Write today for catalog giving complete information.*

UNARCO

UNION ASBESTOS & RUBBER COMPANY

1851 SOUTH 54th AVENUE • CICERO 50, ILLINOIS

**New 8-page catalog (No. 48-1023) "UNARCO Insulations • Asbestos Packings • Gaskets • Textiles"*

Five More Vulcan ROTARY KILNS

To Help Produce an Essential Chemical Material

Right Now, when their output is needed more than ever before, these five Vulcan kilns are going into operation at a well-known chemical plant whose product is indispensable to a wide variety of industries. We congratulate the company whose management was far-sighted enough to anticipate the present emergency and we are proud of our part in this important contribution to our country's welfare.

For more than half a century the Vulcan Iron Works has been a leader in the design and manufacture of Rotary Kilns, Coolers, Dryers, Retorts, etc. Throughout all of this long period we have maintained the highest standards of quality—the best evidence of which is found in our list of users; which includes most of the larger companies in the Rock Products, Chemical Processing and Metallurgical industries.

Correspondence is invited regarding any requirement for the calcining, cooling or drying of any inorganic material. Our experienced engineers welcome opportunities to make suggestions without charge or obligation.

THIS BOOKLET MAY SAVE YOU MANY HOURS OF PRECIOUS WORKING TIME

It tells how to keep kilns running when trouble occurs—either permanently or until replacement parts can be secured. Better still, it tells how to PREVENT TROUBLE through proper precautions during installation and by watching out for conditions which may cause trouble if not corrected in time. Free on request to any one who can use it to advantage. Ask for Bulletin No. 389.

Vulcan Iron Works

Established 1849

WILKES-BARRE, PA., U.S.A.

Cable Address "Vulworks Wilkes-Barre"

Other Vulcan Products include Briquetting Machinery, Electric Hoists, Mining Machinery, Open Hearth Steel Castings, Heavy Special Machinery and all types of Modern Industrial Locomotives Bulletins on request.

in CUBA

for instance . . .

or OHIO . . .

OR ANYWHERE ELSE . . . .

Wherever you go in the chemical industry, you'll find the plants that are operating at maximum efficiency and profit are likely to have LaBour pumps at the critical spots. That's because the industry has learned through 27 years of experience that LaBour pumps are dependable for day-in, day-out service. Dependable service and extremely low maintenance and repair expense combine to make LaBour the low-cost equipment when the long-run figures are honestly tabulated. Those are the only figures that count if you're in business to stay.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. • Elkhart, Indiana, U.S.A.

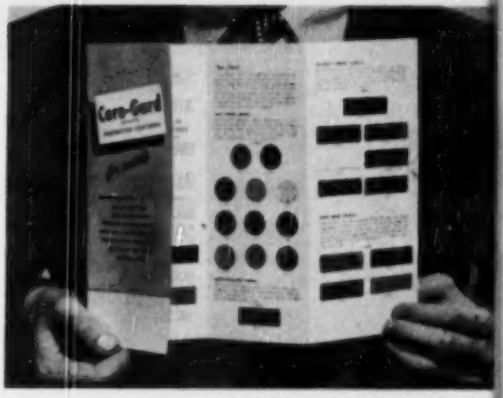
What's corrosion costing you?

Maintenance costs can be lowered with "Coro-Gard" Coating Systems

Have you ever stopped to figure how much corrosion is costing you? Every year millions of dollars' worth of equipment is rusted beyond repair! Production time is wasted with expensive replacement.

"Coro-Gard" Anti-Corrosion Coatings are the answer to this old problem. These tough coatings are vinyl-based, oil-free and have high adhesion and lasting resiliency. *Adhesion* that resists corrosion undercutting—even if the coating's ruptured, and *resiliency* to absorb thermal and mechanical shock.

You can cut *your* corrosion losses with "Coro-Gard". Our engineers have prepared coating systems to satisfy practically every need. Write today.



FREE FOLDER! Gives actual samples of colors and finishes for 15 basic metal-protective coating systems. It shows how "Coro-Gard" cuts the cost of treating equipment, prolongs the interval between coating and re-coating. For FREE copy address: Adhesives & Coatings Div., Detroit. Dept. CE-106.

"Coro-Gard" Systems protect against

Chemical Fumes & Spillings • High Humidity • Fresh or Salt Water Immersion & Spray • Abrasion • Sour Crude Petroleum • Most Industrial Solvents • Marine Growth

WHATEVER your corrosion problem, there's probably a "Coro-Gard" Coating System to save you time and money. Send for FREE sample folder showing 15 basic corrosion and abrasion conditions, and the "Coro-Gard" coatings that fit each need.

Made in U.S.A. by Minnesota Mining & Mfg. Co., Adhesives And Coatings Div., 411 Piquette Ave., Detroit 2, Mich. Also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives. General Offices: Saint Paul 6, Minnesota.

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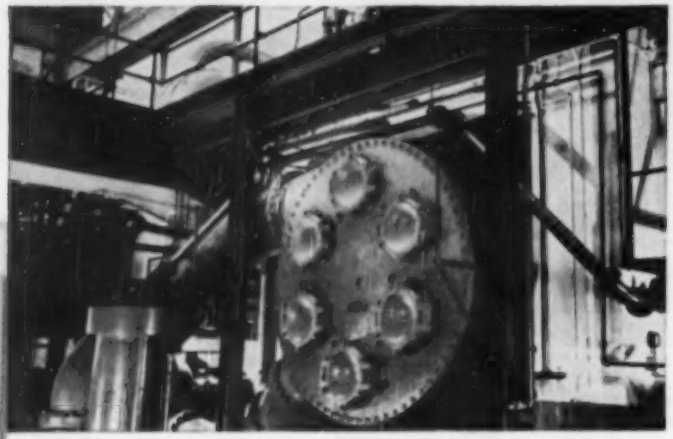
COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared by Bridgeport Brass Company "Bridgeport" *Headquarters for BRASS, BRONZE, and COPPER*



The best tubes possible are needed in a power station condenser to meet the heavy demands made during peak production times. Reduced efficiency and breakdowns are costly during troubled times.

Importance of Selecting Tubes for Long Service Vital Factor

Heavy military and civilian demands for condenser and heat exchanger tubes and piping are taxing the capacity of the mills.

In the future, an increased armament program and shortages of raw materials may possibly lead to mandatory rather than the voluntary form of allocation.

Expansion in the power, refining and chemical fields as well as in other processing industries will also make itself felt in reducing the amount of tubing available for short-term delivery. Engineers would therefore do well to take the long-term viewpoint when selecting alloys.

Study Life, Not Profit

Many engineers have been satisfied to go along with certain tube alloys knowing that there were better alloys on the market but reluctant to increase costs.

With the future indefinite, it would be far better to carry on experimental work with other alloys to determine the alloy best suited to carry them through a long period of heavy armament, if not war, with a minimum of replacement.

One power concern operating two plants has found through study that at one station only aluminum brass will give anywhere near satisfactory service. At the second plant, this alloy has proved its value but Admiralty is still used.

With the knowledge that deliveries of aluminum and high-copper alloys may be curtailed through priorities and dwindling supplies of raw materials, this concern ordered aluminum brass for both plants as their equipment so that tubes may be interchangeable.

Duplex Should Be Studied

In many processing fields, Duplex Tubing (one metal inside and another outside to combat dual corrosion problems) has been overlooked due to the price differential despite the longer service this tubing might give. The heat conductivity of Duplex Tubing is often higher than the ferrous tubing which it replaces. By using Duplex Tubing best suited for the individual job, longer life can often be obtained. At the same time, the increased efficiency of Duplex Tubing will enable higher production at a time when equipment and facilities in all fields will be taxed. Duplex Tubing Technical Bulletin #1950 is available on request.

Shortages Felt

During the last war, about the only alloy available without a high government priority was Admiralty tubing (70% copper, 29% zinc, 1% tin).

Shortages of nickel affected the supply of corrosion-resistant cupro nickel tubing, which was also in great demand by the government for naval vessels. The high copper content of aluminum brass and bronze as well as the shortage of aluminum curtailed the supply of these alloys.

Admiralty is a good alloy for hundreds of salt water applications but in cases involving high water velocities trouble from impingement corrosion may occur.

Laboratory Help Available

Bridgeport's corrosion laboratory has conducted many years of research into the corrosion problem. This information has been greatly augmented by the experiences of plant engineers and operators. For help in selecting alloys for heat exchangers and processing equipment, write to the nearest sales office or contact Bridgeport directly. Also available is "The Condenser Tube Manual" which covers the normal corrosion problems encountered by operating engineers as well as various types of alloys to meet varying demands.

BRIDGEPORT BRASS

BRIDGEPORT BRASS COMPANY, BRIDGEPORT 2, CONN. • *ESTABLISHED 1865*

Mills at Bridgeport, Connecticut, and Indianapolis, Indiana • In Canada: Noranda Copper and Brass Limited, Montreal

catalysis...

and engineering "know how"

taking the catalyst out of the laboratory ... out of the pilot unit into the refinery or chemical plant is a special function of the complete engineering and construction service—*Foster Wheeler*

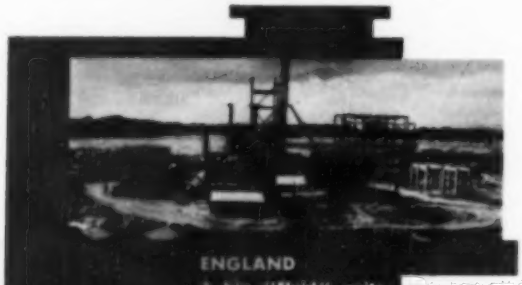
FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

Designers and Constructors of all types of Catalytic Process Units

...with STEEL and STONE and "KNOW HOW"...

Foster Wheeler is building catalytic units in...



ENGLAND
3 big "fluid" units and a large Poly plant are in various stages of construction.

IRAN
At Abadan, construction on another big "fluid" unit nears completion.

BROOKLYN
Converting a Houdry into a modern FCC and building a new Poly unit.

Foster Wheeler construction crews are also at work building Catalytic process units in Spain, Canada, and the United States.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

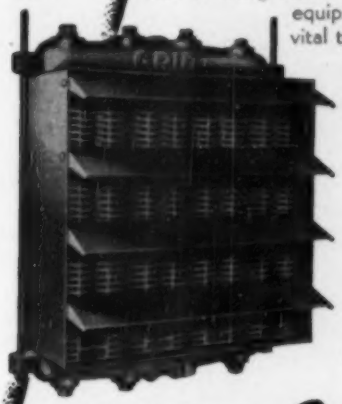
The Complete
Engineering and Construction Service
Anywhere in the World

process units
petroleum refineries chemical plants

DO YOU KNOW..

That it's possible

TO GO THROUGH MANY HEATING SEASONS WITHOUT UNIT HEATER MAINTENANCE EXPENSE, providing that yours is a GRID installation? It's possible, and is being done by major chemical plants, who have investigated and installed GRID equipment. No other unit heater incorporates these features that are vital to proper and efficient chemical plant heating. It's possible because:



GRID cast iron construction withstands corrosive fumes.

GRID wide fin spacing facilitates easy cleaning.

GRID will withstand steam pressures up to 250 lbs., and is free of electrolysis.

GRID fins are cast integral with the steam chamber assuring even distribution of heat. It's not possible for GRID fins to come loose from the steam chamber to cause loss of heating efficiency.

GRID design incorporating proper fan sizes, motor speeds and outlet temperatures results in a properly balanced heating unit, especially when high steam pressures are used.

GRID Equipment

WILL STAND UP UNDER CONDITIONS PECULIAR TO THE CHEMICAL INDUSTRY.....

HERE'S THE PROOF FROM ONE OF OUR USERS IN YOUR OWN INDUSTRY . . .

Gentlemen:

The first GRID Unit Heaters were installed by us eight years ago. We have found the cast iron construction stands up very well against the corrosive fumes of HCl., Cl2 etc., there has not been any maintenance on the units. The unit heaters having copper tubes gives trouble due to corrosion in a few years. We consider GRID Unit Heaters satisfactory and would certainly recommend them for installation where corrosive acid fumes exist.

Yours truly,
A LARGE EASTERN
CHEMICAL PLANT

GRID BLAST COILS . . . for Drying, Tempering outside air, Process work . . .

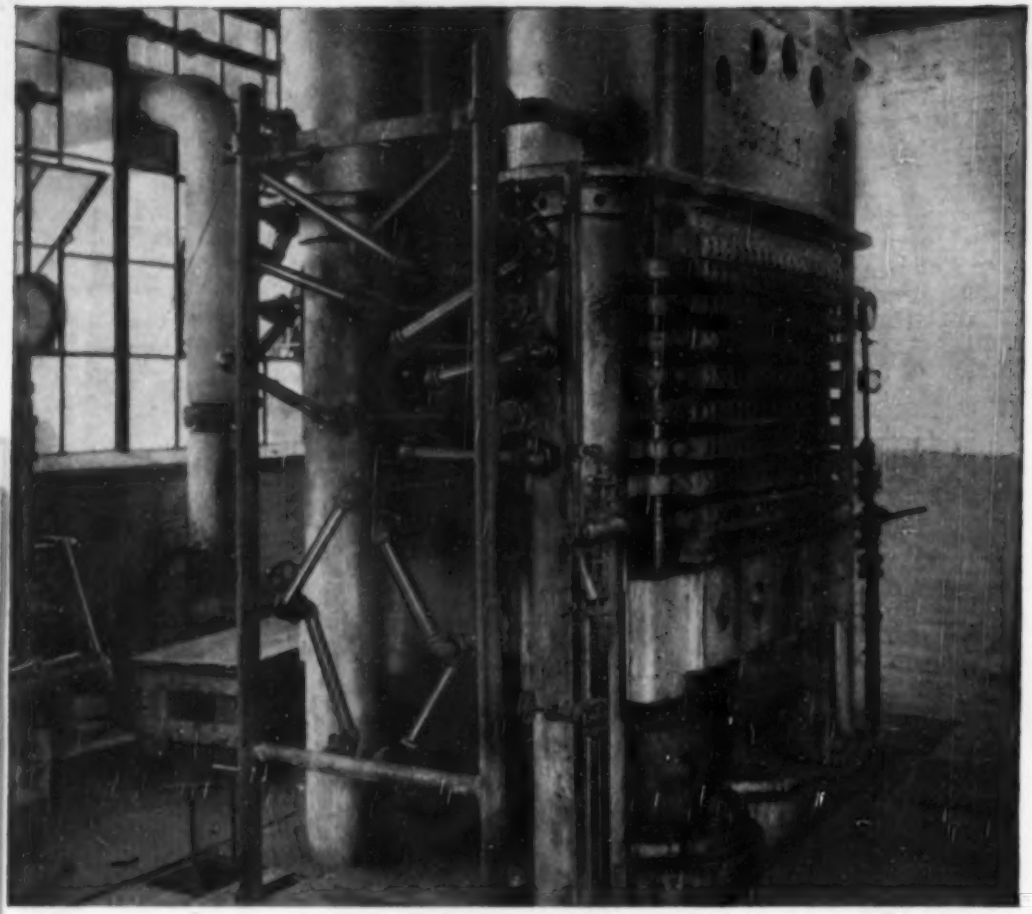
For tempering outside air, drying, process work, GRID Blast Coils have the same high efficiency and lasting qualities as GRID Unit Heaters . . . heating sections the same ONE piece construction high test cast iron guaranteed for steam pressures up to 250 lbs. . . . no electrolysis . . . no tortuous air passages . . . freedom of expansion with complete absence of ruptures, strains and warping . . . open design for easy cleaning . . . atmospheric conditions such as dust, fumes, etc., cannot retard their operation. Compact they occupy less space than other types of cast iron blast coils of equal capacity.

SEND

Write today for "Corrosion" Booklet —catalog CUH-850-CE—catalog GRID BLAST COILS— all yours on request.

D. J. MURRAY MANUFACTURING CO.

WAUSAU WISCONSIN



FLUIDS FOR MOVING PARTS ARE CARRIED BY BARCO ROTARY SWIVEL JOINTS

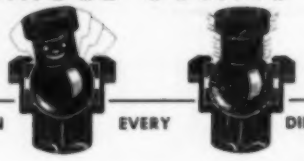
Barco Joints (Rotary Swivel type) are used on this multiple press with outstanding success.

For over forty years, Barco Joints have been serving industry—each year meeting ever-changing problems with constant new development.

In addition, they are used in almost every kind of job requiring *flexible* fluid-conveying systems. By absorbing strain and stress, by compensating for expansion and contraction, Barco joints have proved their value in an infinite variety of applications. Write for full information to Barco Manufacturing Company, 1816K Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

BARCO **FLEXIBLE JOINTS**

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

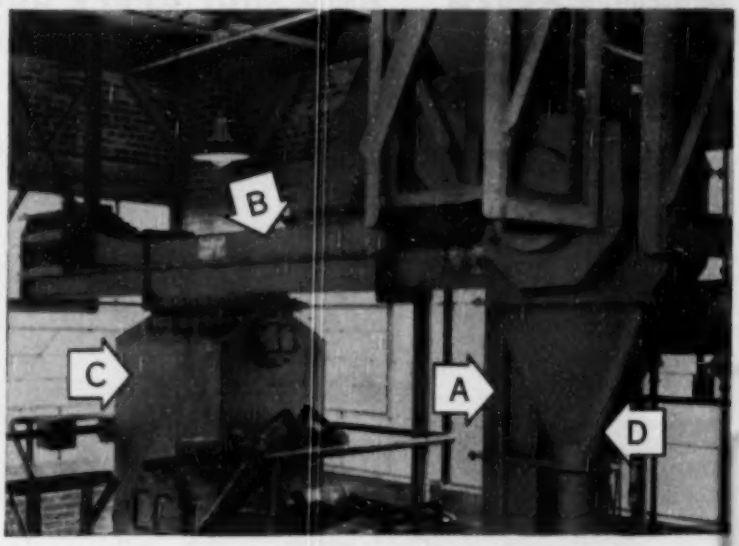


Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN EVERY DIRECTION"

Handling Bean Flakes at *Ralston Purina Mills*

Efficiently, Safely, Economically via BULK-FLO



Typical elevator, conveyor, feeder arrangement at Ralston Purina Mills, solvent extraction plant. Raw flakes elevated by Bulk-Flo (A) discharge to horizontal Bulk-Flo (B), feeding Blaw-Knox extractor (C). Overflow is carried by lower run to collecting hopper (D), then chuted to foot of elevator (A), at ground floor.

• • •

Below: Flaked beans discharged through chute to loop type Bulk-Flo elevator which raises them to 6th floor of extraction building (A in photo above).

Enclosed, Compact Conveyor Operates at Low Cost

Up to two hundred twenty-five tons of soy beans pass through this plant in 24 hours. The bean flakes are handled from flaking machines to solvent extraction tower by Link-Belt Bulk-Flo elevator-conveyor-feeders. This installation is typical of the growing number of solvent extraction plants relying on Link-Belt Bulk-Flo for safe, efficient handling of this material.

The Bulk-Flo is simple, self-feeding, self-discharging and requires a minimum of supporting structures. Power consumption is low, upkeep is negligible. Let Link-Belt engineers help adapt Bulk-Flo to your problems.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

52.103

Ask for Book Number ▲ 2175

LINK-BELT *Bulk-Flo*

Elevator-Conveyor-Feeder

Standard combined run L-path Bulk-Flo, with single feed opening and front discharge head section.

DEMPSTER DUMPSTER® SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

The large photo shows a Universal type Container being transported at the Celanese "Celriver" plant, while two small photos show how a special 10 cu. yd. container is lowered and placed in loading position under bin. Dempster-Dumpster then moves on to service another container. Both type containers have drop bottom dumping action, and are emptied automatically from hydraulic controls in truck cab.

*Reg. U. S. Pat. Off.

Celanese® – recognized across the nation

- TEXTILES
- PLASTICS
- CHEMICALS

. . . Celanese Corporation of America, well known for sound management, uses the Dempster-Dumpster System at its "Celriver", Rock Hill, S. C. yarn plant

Celanese Corporation of America is among the hundreds of well managed manufacturers, both large and small, who use the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs.

This system consists, basically, of one Dempster-Dumpster and any number of detachable Dempster-Dumpster Containers, which are spotted at convenient materials accumulation points inside and outside plants. With only one man, the driver, the Dempster-Dumpster picks up, hauls and dumps (or sets load down intact) one pre-loaded container after another. The capacities of the larger Dempster-Dumpster Containers are equal to and greater than regular dump truck bodies, and they are available in a wide variety of designs each suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish. In some installations one Dempster-Dumpster handles as many as 100 or more containers—increasing man-power efficiency . . . reducing investment and maintenance costs . . . improving "housekeeping" methods . . . reducing fire hazards . . . and providing an easier, quicker, safer and more efficient manner of handling materials. It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

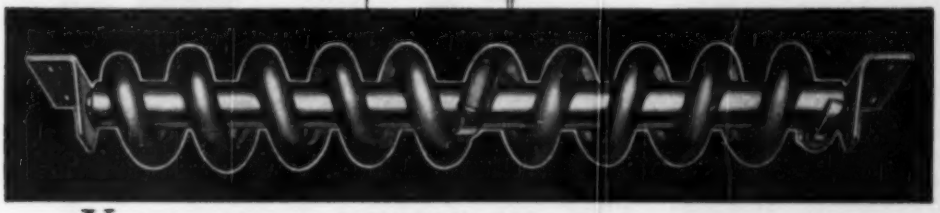
DEMPSTER BROTHERS, 290 DEMPSTER BLDG., KNOXVILLE 17, TENN.

this record proves

THE RETURNS FROM REX SPIRAL RETURN IDLERS

COST RECORD (In a large western coke plant)

TYPE OF IDLER	Steel	Rubber Covered Spiral
SERVICE LIFE	3 months	12 months
COST 1st YEAR	$66.80 for 4	$47.70 each
SAVING 1st YEAR		$19.10
Cost of Replacement		
Subsequent Years (per year)	$66.80 for 4	$18.20 each (rubber covering)
SAVING per year after 1st YEAR		**$48.60**



Yes, the cost record from *just* this one plant clearly demonstrates the savings possible through the installation of Rex Rubber Covered Spiral Return Idlers.

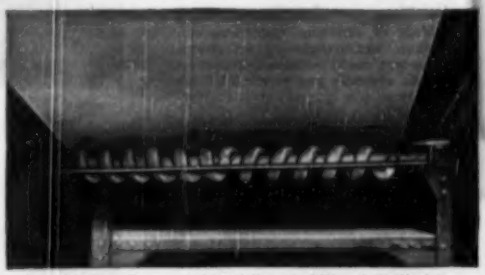
Before the installation of these cost-cutting idlers, the abrasive action of coke breeze clinging to the return side of the belts wore out the standard steel return idlers in an average 3-month period.

15 Rex Spiral Return Idlers were installed for trial and have given at least 12 months' service—4 times longer than the steel idlers. These idlers provide a constant, ever-changing point of contact between idler and belt, preventing build-up of material on the idler and, in some cases, helping to clean the belt.

Cost records show that the 15 Rex Spiral Return Idlers made possible a saving of $19.10 per idler and $286.50 total saving, including initial and installation costs. After the first year, the spiral rubber covering can be replaced, if worn, at a cost of $18.20 per idler. This cost as compared to $66.80, the cost of 4 new steel return idler rolls, indicates a saving after the initial year of $48.60 per year.

Add to these savings, the elimination of down-time caused by the frequent replacement of steel idler rolls, which makes the cost-cutting advantages of Rex Rubber Covered Spiral Return Idlers even more obvious.

Why not investigate the advantages of Rex Spiral Return Idlers and the other idlers in the Rex Line for your operations? Mail the coupon for your copy of Bulletin No. 463R.



Rex Rubber Covered Spiral Return Idlers installed in this western coke plant delivered 4 times longer service than conventional steel return idlers previously used.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

Chain Belt Company 50-214
1648 W. Bruce Street
Milwaukee 4, Wis.

Please send me a copy of Bulletin 463R.

Name.....

Company.....*Dept*.....

Address.....

City.....*State*.....

Three Exclusive Features Account for the POPULARITY OF BOWEN LABORATORY SPRAY DRYERS

Dryer Open for Cleaning

1. *They are easy to clean*
The chamber is hinged at the base for quick opening. The entire inside of the chamber can be easily reached for brushing out or washing. Duct work and collector are flanged and fastened with quick-opening wing nuts.

2. *They are simple to operate*
Made of stainless steel throughout where wet material or dry product contacts metal surface, the unit has been specially engineered for compactness and ease of operation.

3. *They are actually miniature commercial spray dryers*
The Bowen Laboratory Spray Dryer operates as a miniature of the Bowen commercial dryers. The same type of atomization is used. Because design and proportion of equipment parts are simply smaller in size, operation of the laboratory unit simulates full scale production technique.

Write for a list of companies who are using Bowen Laboratory Spray Dryers in your field.

BOWEN ENGINEERING, INC.
NORTH BRANCH 4
NEW JERSEY

Recognized Leader in Spray Dryer Engineering ... Since 1926

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Coordinated Service
FOR THE ENTIRE NATION

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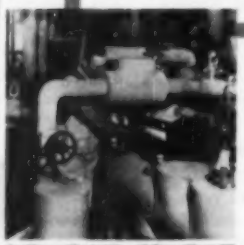
"PRECISION MOLDED"
85% MAGNESIA and "PRASCO"
HIGH TEMPERATURE INSULATIONS



- Only PABCO approved Engineering Service Units are privileged to display the above emblem.
- Strategically located throughout the United States to best serve industry.
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- Reliable duplication of any job in any locality—including materials, workmanship, application methods.

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PABCO
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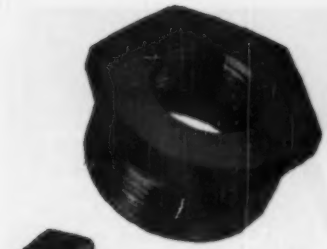
Manufacturers of Heat Insulation Since 1920



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stainless steel pipe fittings to solve your corrosion problems

All screwed Caps, Couplings, Plugs, Bushings and Unions up to and including 2" I.P.S. are machined from solid bar stock.

These fittings—sold at same price as competing 150 lb. cast fittings — can be used where working pressures of up to 1000 lbs. are experienced.

These stainless steel fittings are available in Types 304, 316 and 347.

Write TODAY for the 1950 Camco catalog and price schedules!

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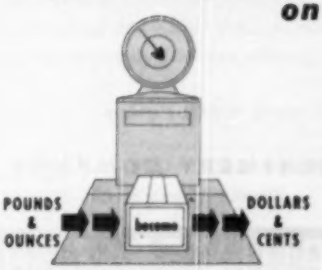
Chemical laboratories depend on Printweigh accuracy

Shipments automatically checked and weights printed

MATERIAL becomes MONEY on your SCALES!



Errors made at the scale stay wrong forever. There is no chance to recheck; either the material has been shipped or has lost its identity in the general stock. You've got to be *right* —weigh it right— Toledo Printweigh means *accurate* weights *accurately* recorded!

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TOLEDO *All the Way*

SAVED

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93% IN POWER

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Two-pass Wet Milling MIKRO PULVERIZER installation grinding clay-graphite mix

Leading manufacturers of pencils and crayons have applied the Wet Milling MIKRO-PULVERIZER to grinding their clay-graphite and color sludges. It had been previous practice to ball mill this sludge.

In one plant the former procedure had been to run a batch of about 150 gallons in ball mills requiring a total of 25 h.p. for a period of more than 50 hours. The same finished product is produced in a Wet Milling MIKRO-PULVERIZER in 8 hrs. using 10 h.p.—1250 h.p. hrs. compared to 80 h.p. hrs.

The Wet Milling MIKRO-PULVERIZER has found a considerable use in the food products field, color and dyestuff industry, as well as for pharmaceutical ointments and the chemical, clay, cosmetic and insecticide industries. It is equally successful on both pastes and slurries. For grinding solids in suspension, or subjecting the material to an intensive mixing action—the MIKRO generally will do either, and do it better with less power.

Also available for Dry Milling, our full line of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS noted for thorough blending and precise particle control . . . grinds from granular to ultra-fine in lower micron range . . . capacities from 75 to 25,000 lbs. per hour. For complete recovery of solids and elimination of industrial dusts, investigate our MIKRO-COLLECTOR.

See the MIKROS on display
Booths 52 and 53
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5510 Chatham Road Summit, N. J.

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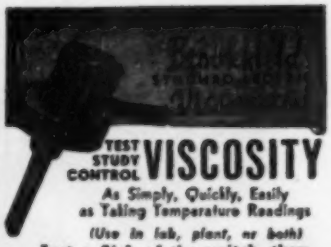
Reg. U. S. Pat. Off.

Also Makers of the MIKRO-COLLECTOR

PRESERVE OUR HERITAGE FAITH FREEDOM AND INCENTIVE



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VISCOSITY

As Simply, Quickly, Easily as Taking Temperature Readings

(Use in lab, plant, or both)

Just a flick of the switch, then read the Brookfield dial, and you have your viscosity in centipoises. The whole operation, including cleaning up, usually takes *less than a minute.*

Suitable for extremely accurate work with a wide range of materials, both Newtonian and non-Newtonian, the Brookfield viscometer is portable and plugs in any A.C. outlet.

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NEW! **Two motors and exclusive counter-rotation action make new Brookfield Laboratory Mixer quickest, most effective on market. Creates annular flow, provides up to 48,000 scissor-like cuts/min., stops messy clop-overs. Write today.**

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Ampex Magnetic Tape Recorders offer the only proved means of making electrically reproducible recordings up to 40,000 cps! Such critical recording permits detailed study of particular phenomena from tape loops, or other automatic data reducing systems. Up to 14 channels of data recorded simultaneously on separate tracks where required. Special systems record down to 0 cycles with no phase shift or wave form distortion. Write for analysis of your specific problem.

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STANDARD OF THE GREAT RADIO SHOWS

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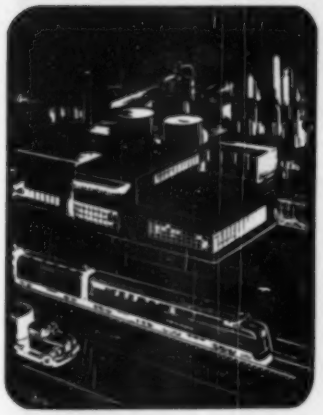

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Leadership in any field is a wonderful tribute to a fine product. But the Layne organization is anxious to have all prospective buyers consider the genuine quality of their Well Water Systems. Layne wants people to remember that their years and years of world-wide experience is being used to build better and better water systems; to find and remove even the smallest imperfection of materials; to create, test and use new ideas that step up efficiency without adding cost.

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Consists of nine matched thermometers reading from −36 to +760° F. or from −38 to +405°C. Ranges overlap. Each thermometer supplied with individual calibration certificate for total immersion.

Experts in every field have long known the value of being able to choose just the right tool for the specific task at hand. With the introduction of the new Master Sets of A.S.T.M.* Certified Extreme Precision Thermometers, TAGliabue extends this sound principle to the field of exacting temperature measurement.

Now, from a *matched* set of nine thermometers, you can select the one best suited to whatever test you may be running. All thermometers conform to A.S.T.M. standards of accuracy, and each is provided with its own calibration certificate to compensate for individual scale characteristics. Packed in protective plush-lined case.

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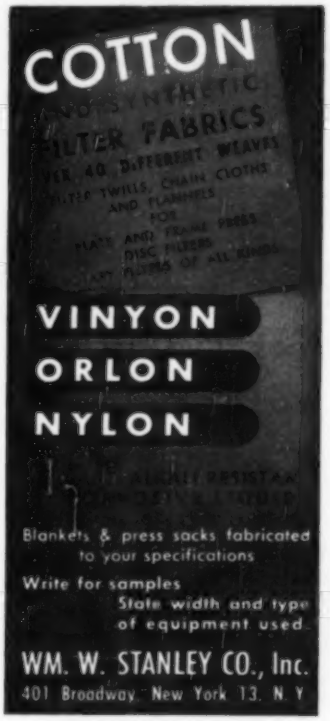

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Pick out the type best suited to your individual needs, whether it be one of the above, moulded or machined parts, or standard Teflon Packing.

A proven product for which new uses are being found every day, Teflon's principal attributes are its chemical resistant qualities. If you have a chemical problem, put Teflon to work for you today.

Power Products Company carries a complete line of Teflon packing, gaskets, sheet, tube rod and tape. We welcome inquiries about special applications and custom made items

When ordering pump packing specify #101 (graphite) on all except stainless steel valves and pumps. On stainless steel use #201 (mica.)

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SUPER-CLEAN AIR with simplified maintenance

ELECTRO-CELL KEEPS DUST AND SMOKE OUT AND OPERATING COSTS DOWN

YOU get super-clean air at a saving with the installation of an AAF Electro-Cell. This modern electronic precipitator gives positive protection against dust and soot—even down to such fractional micron sizes that its true efficiency can only be evaluated by the Discoloration Method of testing.

Removable collector plate cells permit selection of the maintenance method best suited to your operation. Cells may be manually washed and re-oiled in place; removed for easy cleaning in a special tank, or washed, dried and recoated automatically with minimum interruption to operation.

The Electro-Cell's sectional construction reduces weight of parts, eliminates multiplicity of electrical connections, protects wiring from dirt and water. And its full-height hinged or removable ionizers minimize electrical losses, reduce ozone and simplify replacement of ionizing wires.

If you want positive protection against soot and dust plus proven savings in operation and maintenance, get complete Electro-Cell data now. Just contact your local AAF representative or write direct for Bulletin No. 252.

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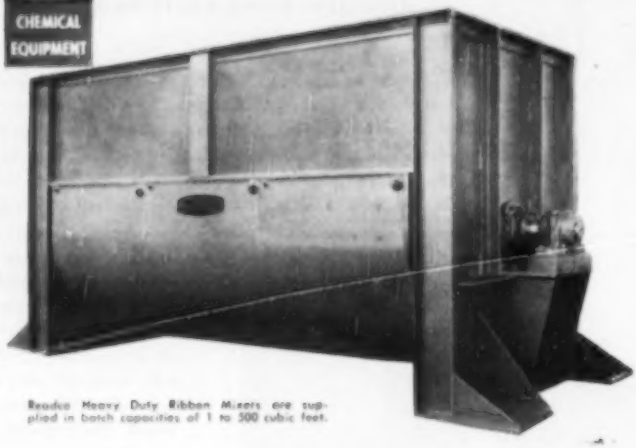
AAF

AIR FILTERS AND DUST CONTROL EQUIPMENT

Readco Heavy Duty Ribbon Mixers Provide Complete Incorporation With Efficient Spray Manifolds

READCO CHEMICAL EQUIPMENT



Readco Heavy Duty Ribbon Mixers are supplied in batch capacities of 1 to 500 cubic feet.

Unexcelled for blending of plastic, semi-plastic, moist and dry materials

Readco Heavy Duty Ribbon Mixers may be equipped with Spray Manifolds for admission of liquids during blending. A continuous spray (no drops) provides complete incorporation of liquids without the formation of agglomerates.

Pile-up of materials at any point is eliminated by accurately proportioned ribbons and limited clearance between ribbon and shell.

Ribbon Mixers are built in all sizes . . . of carbon steel, stainless steel, or any other commercial alloy. High or low pressure jackets and vacuum covers are optional.

The agitator shaft is mounted in outboard, anti-friction bearings. Packing glands are independent of bearings. Standard design permits vertical removal of agitator from mixer. Removable end type available.

NOW . . . continuous mixing! Readco offers continuous as well as batch mixers. Write for complete details.

Literature and prices on **Readco** Heavy Duty Ribbon Mixers are available upon request.

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of The Standard Stoker Company, Inc.
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The Hard Coal Filter Medium

PROVIDES:

GREATER CAPACITY
LONGER FILTER RUNS
CLEANER WASHINGS AT LOWER COST
REMOVES ENTRAINED TURBIDITY FROM INDUSTRIAL PROCESS SOLUTIONS OR WASTES.

These features in **ANTHRAFILT** add up to one big item for you: *Savings!*

Anthrafilt* is a hard coal filter medium that will save you money regardless of whether you filter acetic and sulfuric acid, or caustic soda solutions, boiler condensate, sanitary or process water!

NO water soluble constituents remain in **ANTHRAFILT*** to contaminate or contribute tastes or odors to filtered solutions. *Reason:* practically all minerals other than the inherent ash has been removed during preparation of **ANTHRAFILT***.

You are invited to write us today for full details and recommendations.

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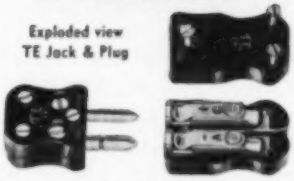
*Trade Mark Reg. U. S. Pat. Off.

SIMPLIFY THERMOCOUPLE CONNECTIONS

Exploded view TE Jack & Plug



These Quick Coupling Jacks and Plugs make connecting thermocouple circuits—*Simpler, Easier, Quicker*—especially when circuits must be broken frequently.

The Polarized Connectors are made of thermocouple material with either screw fastened or soldered connection. Bakelite cover halves are screw fastened; have finger-grip pull. The lead wire openings clamp duplex wire securely — relieving strain from connections.

For more information about these Connectors, Panels, Thermocouples, Lead Wires and Accessories, Write, now, for Catalog E.

FAIR LAWN — *Thermo Electric* CO., INC. — NEW JERSEY

BLACKMER SLIDING VANE TYPE

POSITIVE DISPLACEMENT BLACKMER PUMPS are equipped with replaceable liners and "self-adjusting for wear" vanes for chemical processing and liquid material handling. Choice of vane and liner material allows wide range of service. Capacities of 5 to 1500 gallons per minute.

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VANES IN EITHER TYPE OF PUMP ARE EASILY REPLACED AT LOW COST

BLACKMER *CUTS LIQUID MATERIAL HANDLING COST*

Volatile and viscous liquids, and many corrosive or mildly abrasive liquids and semi-solids are handled by Blackmer Pumps in chemical process plants because maintenance and replacement costs of working parts are low and no "out of service" delays are necessary.

Bulletin 307, "FACTS," Lists Data Vital to Process Plant Pump Engineers

"FACTS" contains design and construction, maintenance, operation and application data for better pump service.

WRITE FOR YOUR COPY

BLACKMER PUMP COMPANY
GRAND RAPIDS, MICHIGAN

NEW HEAT SAVING EFFICIENCY

...with MUNDET CUSTOM MOLDED 85% MAGNESIA

Now available in pipe covering and block insulation, Mundet 85% Magnesia permits new heat-saving efficiency. Precision manufacturing on the latest type of automatic equipment insures uniform standards. Extra durability is built into the insulation. It does not "powder", settle or disintegrate. It is unaffected by either steam or water leakage. It maintains an attractive, smooth finish. Precision pipe fit is assured, with no spaces left for the escape of heat. You benefit from the most modern manufacturing facilities for the production of heat insulation. Write for specification information and recommendations. Mundet Cork Corporation, Insulation Division, 7101 Tonnelle Avenue, North Bergen, N. J.

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C-O-TWO ANNOUNCES

Underwriters' Laboratories, Inc. Listed

Low Pressure Carbon Dioxide Type Fire Extinguishing Systems

ECONOMICAL, EFFICIENT FIRE PROTECTION
from a single storage tank

C-O-TWO now adds another outstanding contribution to modern fire fighting . . . *C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems.* Carbon dioxide stored in bulk under low pressure, means greater fire protection for your larger size fire hazards at less cost.

Flexibility is the keynote of these new type C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons, and can be operated as straight manual, partially automatic or fully automatic systems.

Flammable liquids, electrical equipment, storage and manufacturing processes can all be made firesafe from a single low pressure carbon dioxide storage tank. If fire strikes the system quickly goes into operation and the fast-acting, non-damaging carbon dioxide extinguishes the blaze in seconds.

COMPLETE CARBON DIOXIDE FIRE PROTECTION

With this new addition C-O-TWO offers complete, fully approved carbon dioxide fire protection . . . hand portables, wheeled portables, hose units, high pressure cylinder systems and low pressure storage tank systems. Whether your fire protection problem is a factory, mill, warehouse, power station or research center you have the assurance of the best type equipment for the particular fire hazard concerned.

Let an experienced C-O-TWO Fire Protection Engineer help you in planning up-to-date, fully approved fire protection now before fire strikes. Complete free information and descriptive literature available on request. Get the facts today!

C-O-TWO FIRE EQUIPMENT COMPANY
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Sales and Service in the Principal Cities of United States and Canada

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anti-corrosive

strapping and seals

Our specialized service will supply just what you need for securing insulation to forms, pipe lines and tanks. Strapping and Seals produced in

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Strapping Tools for applying.

FREE
Handy calculator—one side tells you which strap to use for any given corrosive condition; other side determines length and weight of strap required for any binding operation.

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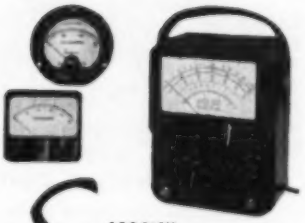

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for accurate Dependable electrical Measurements!

Let Simpson engineers help you solve your panel instrument problems—and for your standard instrument requirements take advantage of our large stock.

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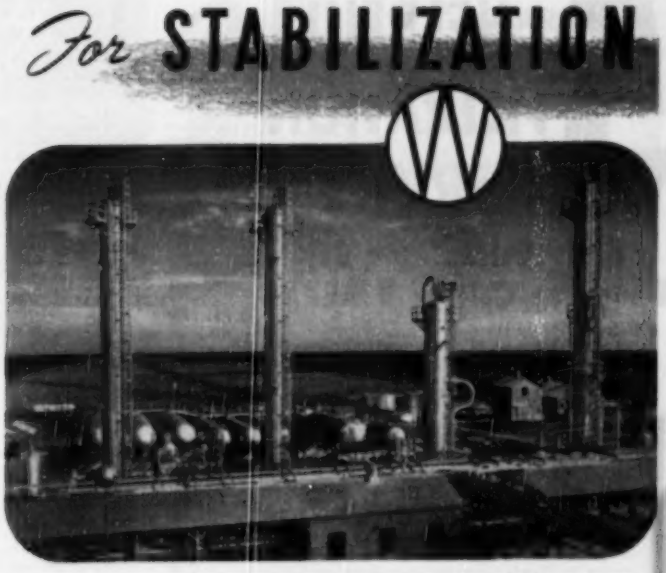

WARREN PETROLEUM CORPORATION

Another example of Western's job-tailored heat transfer efficiency . . . the Holliday, Texas Stabilized Natural Gasoline plant of Warren Petroleum. Among these Western engineered installations are U-Tube Reboilers . . . Floating Head Exchangers . . . and Bare Tube Atmospheric Sections. Here, too, Western's rigid policy of close attention to detail and specification from design to installation has made it possible, from a heat transfer standpoint, for this Warren plant to successfully manufacture quality products in a highly competitive market.

Engineering proficiency . . . fabrication skill and adaptability . . . time-table service . . . have put Western heat transfer equipment in demand in refineries . . . chemical processing plants . . . and pipe line stations throughout the world.

WESTERN MEANS TAILORED HEAT TRANSFER EQUIPMENT TAILORED FOR HEAVY DUTY . . . TAILORED FOR DURABILITY.

TEMA

WESTERN HEAT EXCHANGERS

Manufactured by

WESTERN SUPPLY COMPANY

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SALES OFFICES — DALLAS — HOUSTON

SAN FRANCISCO REPRESENTATIVE: TRIDENT ENGINEERING COMPANY

5 HELPFUL FILTRATION SERVICES

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1

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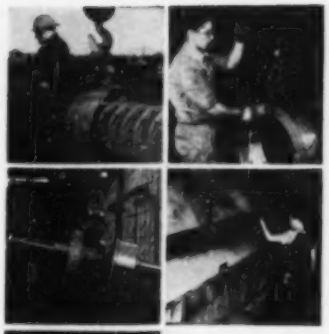

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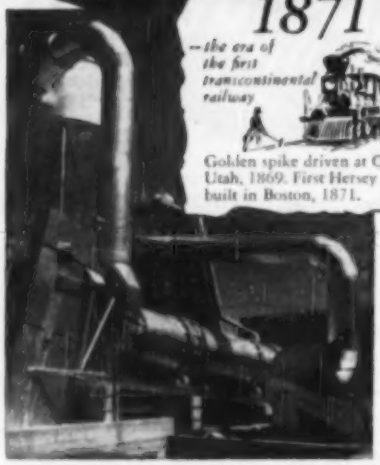

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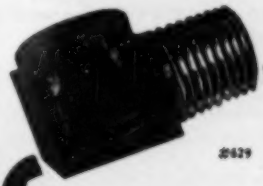

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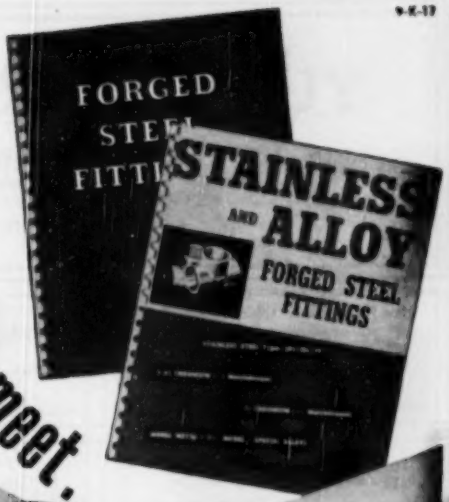

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Give experience, education, age, references, personal history, salary received and salary expected. Please be complete and specific.

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2—Buffalovak, Vacuum Drum Dryers 24" x 20".
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2—Buffalo Double Door Vacuum Shelf Dryers 12 & 15 shelves.
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3—Buffalo Flakers 5' x 12'.
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1—Sanbury Mixer #1 with 50 HP Motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers with Motors & Drives, 100 gals. cap.
1—Cavagnarro Vacuum Type Double Arm Mixers, with Motor & Drive, 100 gals. cap., Stainless Steel.
2—Cavagnarro Steel Jacketed Mixers, Chromium Plated, interior double arm, fishtail blades, 100 gals. cap., vacuum type with 40 HP Motors & Drives.
2—J. H. Day Double Arm Jacketed Mixers, 50 gals. cap., sigma blades.
1—Baker Perkins Laboratory Mixer, size #5.
1—Baker Perkins Double Arm Jacketed Mixer, 200 gals. cap. Sigma Blades.

THE GELB GIRL—OCTOBER 1950

3—Shriver Plate & Frame, Laboratory Filter Presses, 7" x 7".
1—Shriver Filter Press, 42" x 42" 46 chambers, side-feed, open-delivery, washing type.
1—Shriver Filter Press, 36" x 36", closed delivery, side-feed, 25 chambers.
1—Sperry 36" x 36" Recessed Type Filter, center feed, open-delivery, 42 Horsite covered Plates.
1—Sperry Filter Press Skeleton, 42".
1—Shriver, Rubber-Lined Filter Press, 36" x 36", 36 chambers, closed delivery.
1—Sperry 24" x 24" Cast-Iron, Filter Press, 22 chambers.
1—Sperry Aluminum Filter Press 18" x 18", 9 chambers.

3—Baker Perkins Double Arm Mixers, 200 gals. cap., Sigma Blades.
1—Patterson 5,000 gals. cap. Turbo Mixer "Unused."
1—Patterson Nickel-Lined Blender, 192 cu. ft. cap. with 30 HP Motor.
2—J. H. Day Mogul Type Mixers, 2½ and 5 gals. cap.
5—Simpson #9 Intensive Mixers "Unused".
1—Day Peary Mixer 15 gals. cap.
1—Gemco Copper Conical Blender, 3½ cu. ft.
10—Sharples Super Pressurite Centrifuges #8.
3—Sharples Super Pressurite Centrifuges, Stainless Steel Bowl, Model #16.
1—Podbielniak Stainless Steel Centrifugal Extractor Model #8080.
1—Royle #1 Perforated Extruder, with heating unit.
1—Allis Chalmers Tube Mill 5'9" x 18", Silex Lined.
3—Hardinge Conical Ball Mills 8' x 20", 8' x 22", 6' x 22".
1—Abbe Engineering Silex-Lined Pebble Mill, 6' x 12'.
1—Ball Mill, Stone-Lined, 7' x 8'.
1—Buss Laboratory 3-Roll Paint Mill, 5" x 6".
1—Kent Laboratory 3-Roll Paint Mill, 4" x 8".
1—Eppenbach Stainless Steel, Colloid Mill, Model #QV7.
1—EDMCO 2-Roll Laboratory Mill 6" x 12".
1—Baw Knox Jacketed Autoclave 8' x 4'2" with agitator.
1—Cumberland Granulator with 15 HP Motor.
1—Mikro Pulverizer #2TH with 15 HP Motor.
1—Mikro Pulverizer #1SH with 3 HP Motor.
1—Mikro Bantam size Bronze Pulverizer.
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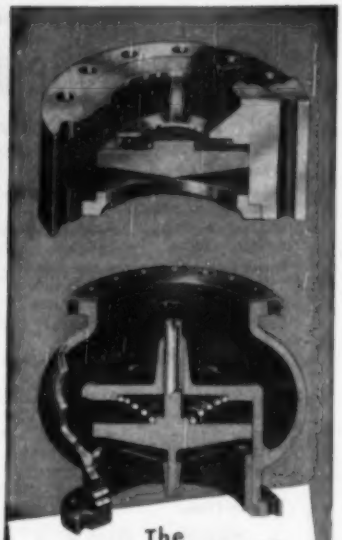

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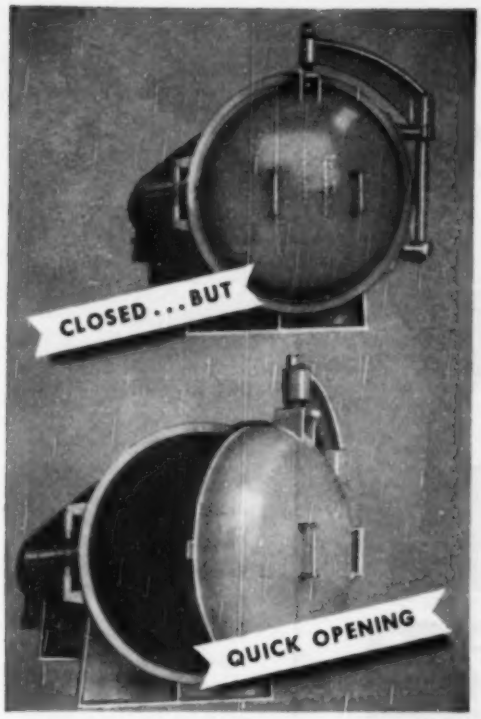

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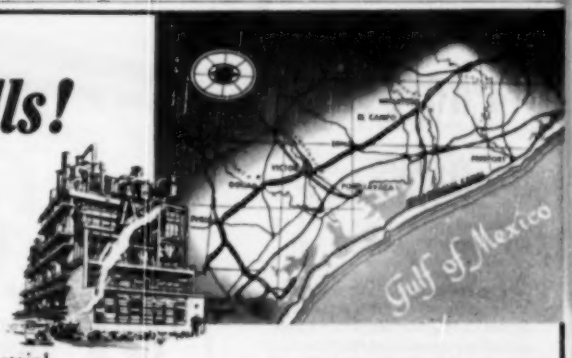

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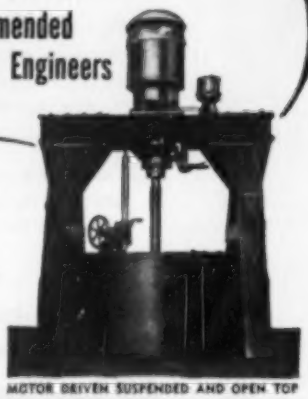

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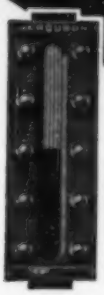

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Reader Service

HOW IT WORKS

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TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are two indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised. The index of advertisers is on the preceding page.

NUMBERS EXPLAINED

Advertisements:—There is a page number on the postcard for each advertisement. Before the number, may appear, L, R, T, B (left, right, top,bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items:—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

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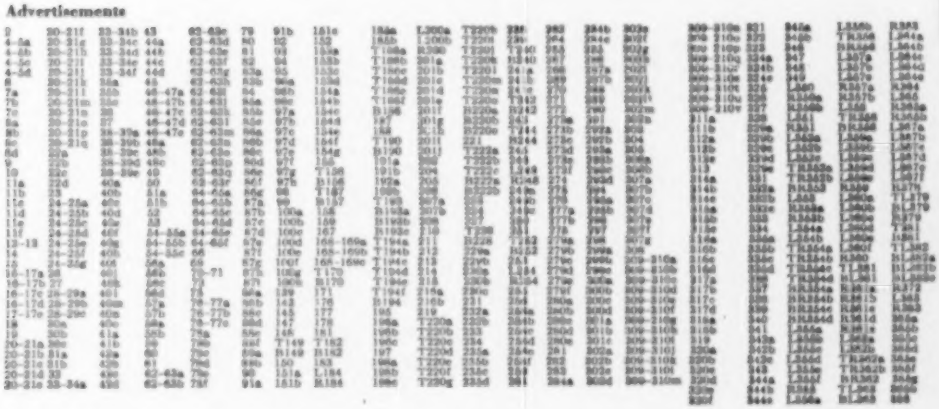

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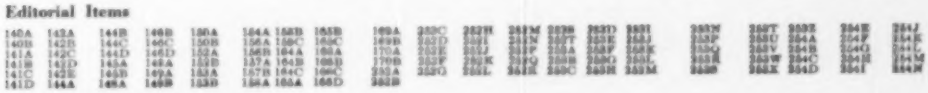

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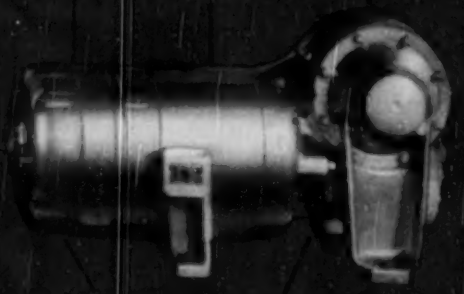

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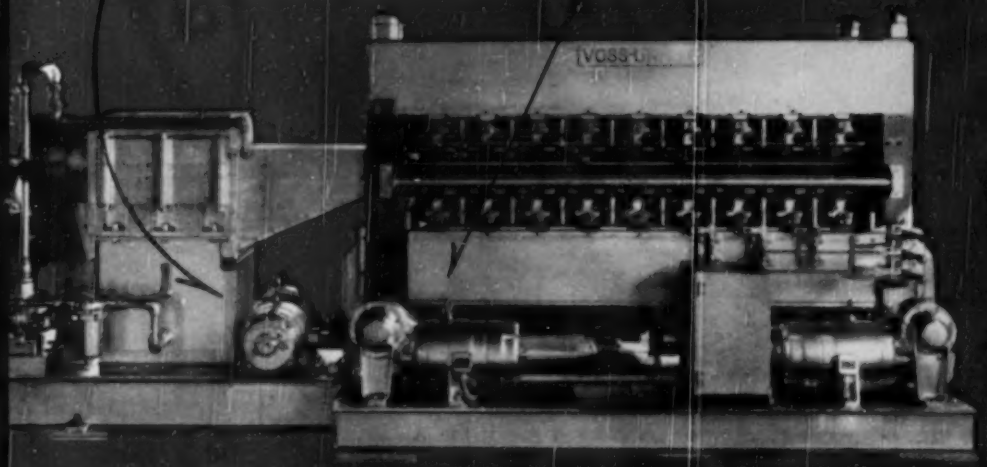

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